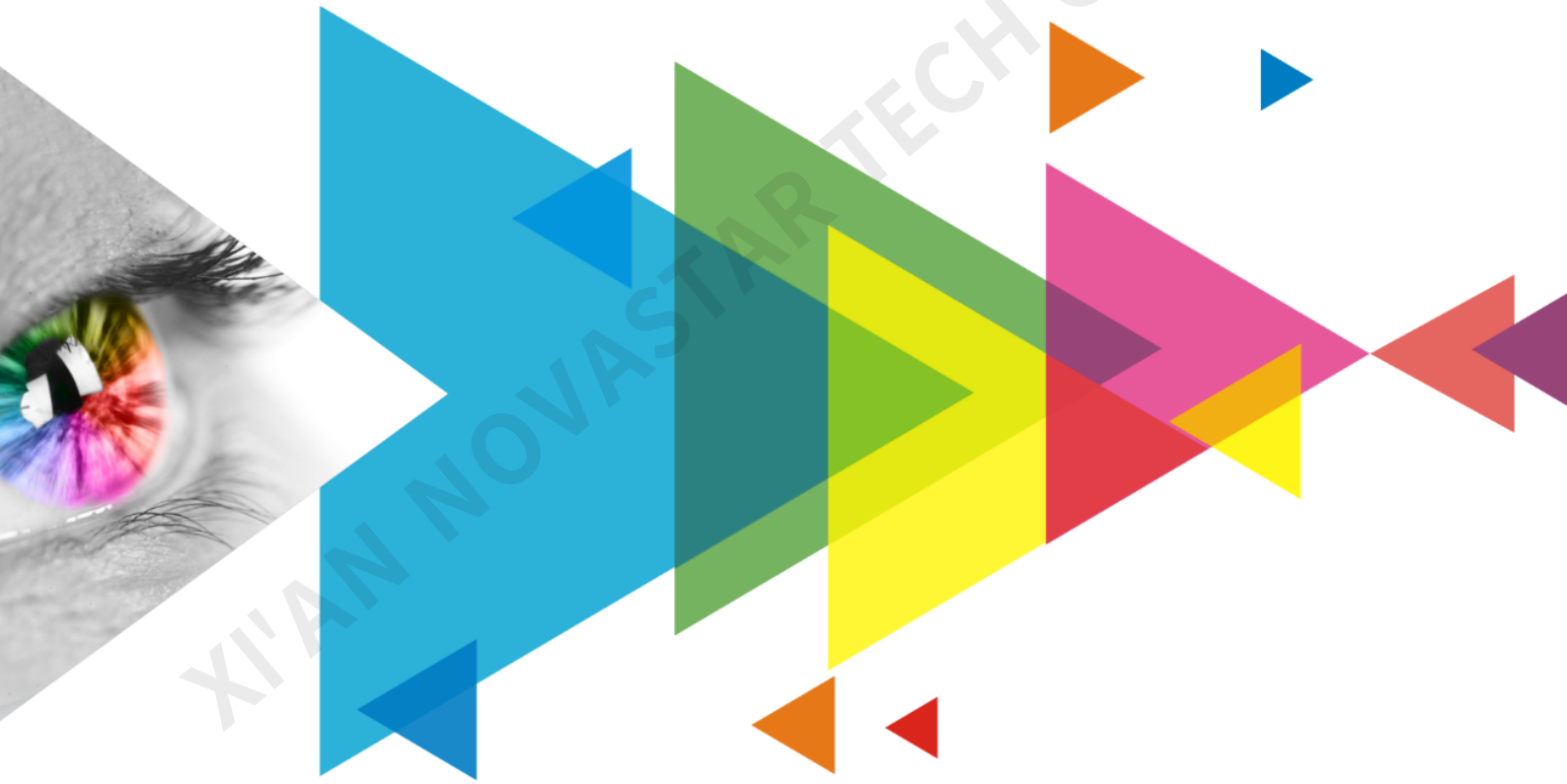
CA50E

Receiving Card



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Specifications

Change History

Document Version	Release Date	Description
V1.1.0	2023-04-19	• Added the Thermal Compensation feature. • Updated the load capacity related description. • Updated the certification information. • Updated the dimensions diagram. • Updated the pins section. • Updated the packing box dimensions.
V1.0.0	2022-07-09	First release

Introduction

The CA50E is a high-end 5G receiving card in the new-generation control system COEX series of Xi'an NovaStar. Tech Co., Ltd. (hereinafter referred to as NovaStar). For 8-bit and 10-bit video sources, a single CA50E supports resolutions up to 768×512@60Hz. For 12-bit video sources, a single CA50E supports resolutions up to 512×480@60Hz.

This receiving card supports the exclusive Dynamic Booster, Full Grayscale Calibration and LED Image Booster technologies of NovaStar. It also supports the HDR, Frame Rate Adaptive, ShutterFit, quick adjustment of dark or bright lines, low latency, the pixel level brightness and chroma calibration, 3D, image rotation in 90° increments, and more, greatly improving the brightness, grayscale and color performance from every aspect and offering users an ultimate visual experience with a uniform, smooth and lifelike image.

The CA50E uses high-density connectors for communication to limit the effects of dust and vibration, resulting in high stability. It supports up to 32 groups of parallel RGB data or 64 groups of serial data (expandable to 128 groups of serial data). Its reserved pins allow for custom functions of users.

Note

To use this product, please contact NovaStar first for solution evaluation and analysis.

Certifications

RoHS

If the product does not have the relevant certifications required by the countries or regions where it is to be sold, please contact NovaStar to confirm or address the problem. Otherwise, the customer shall be responsible for the legal risks caused or NovaStar has the right to claim compensation.

Features

Improvements to Display Effect

- Thermal Compensation
  Work with NovaStar's high-precision calibration system to precisely collect the thermal distribution data of LED cabinets and generate unique thermal compensation data for each pixel of the cabinets, effectively eliminating the cabinet or module level # shaped bars caused by uneven thermal distribution.
- Dynamic Booster
  Real-time analysis and dynamic adjustment are made to each frame to significantly improve the display contrast and image details for better visual experience, and effectively control and lower the display power consumption, extending the service life of the LED screen.

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- Full Grayscale Calibration
  Work with NovaStar's high-precision calibration system to generate unique calibration coefficients for each grayscale, ensuring uniformity of each grayscale and improving the screen's image quality.
- HDR function
  - Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards.
  - Support HLG.
- LED Image Booster (Effects depend on driver IC)
  - Color Management: Support the standard color gamuts (Rec.709, DCI-P3 and Rec.2020) and custom color gamuts, enabling more precise colors on the screen.
  - Precise Grayscale: Individually correct the 65,536 levels of grayscale (16bit) of the driver IC to fix the display problems at low grayscale conditions, such as brightness spikes, brightness dips, color cast and mottling. This function can also better assist other display technologies, such as 22bit+ and individual gamma adjustment for RGB, allowing for a smoother and uniform image.
  - 22bit+: Improve the LED display grayscale by 64 times to avoid grayscale loss due to low brightness and allow for more details in dark areas and a smoother image.
- Frame Rate Adaptive
  Adjust the receiving card parameters in real time according to the input frame rate, so that the display effect at different frame rates is the best.
- ShutterFit
  Adjust the driver IC parameters according to the camera shutter angle to fix problems of black lines, grayscale addition, and grayscale loss during camera shooting in XR scenarios.
- Quick adjustment of dark or bright lines
  The dark or bright lines caused by splicing of modules or cabinets can be adjusted to improve the visual experience. The adjustment can be in milliseconds.
- Low latency
  The latency of video source on the receiving card end can be reduced to 1 frame (only when using modules with driver IC with built-in RAM).
- Pixel level brightness and chroma calibration
  Work with NovaStar's high-precision calibration system to calibrate the brightness and chroma of each pixel, effectively removing differences and enabling high consistency for both brightness and chroma.
- 3D
  Working with the controller that supports 3D function, the receiving card supports 3D output.
- Image rotation in 90° increments
  The display image can be set to rotate in multiples of 90° (0°/90°/180°/270°).

Improvements to Maintainability

- Calibration coefficient management
  The calibration coefficients can be uploaded quickly, read back, and saved to hardware.
- Automatic module calibration
  After a new module with flash memory is installed to replace the old one, the calibration coefficients stored in the flash memory can be automatically uploaded to the receiving card when it is powered on, which ensures unchanged uniform display brightness and chroma.
- Module Flash management
  For modules with flash memory, the information stored in the memory can be managed. The calibration coefficients and module ID can be stored and read back.
- Quick uploading of calibration coefficients
  Upload the calibration coefficients quickly to the receiving cards to improve efficiency.
- One-click application of calibration coefficients in module Flash
  For modules with flash memory, when the Ethernet cable is disconnected, users can hold down the self-test button on the cabinet to upload the calibration coefficients in the memory of the module to the receiving card.
- Mapping function
  The cabinets can be marked on the screen by the color, Ethernet port number and receiving card number, allowing users to easily obtain the locations and connection topology of receiving cards and quickly complete screen configuration and other operations.
- Setting of a pre-stored image in receiving card
  The image displayed when the Ethernet cable is disconnected or there is no video signal can be customized.
- Cabinet Finder
  The cabinet can be marked with a frame on the screen and the indicator status is changed, allowing users to quickly locate the cabinet and troubleshoot problems.
- Temperature and voltage monitoring
  The receiving card temperature and voltage can be monitored. Any exceptions can be reported actively.

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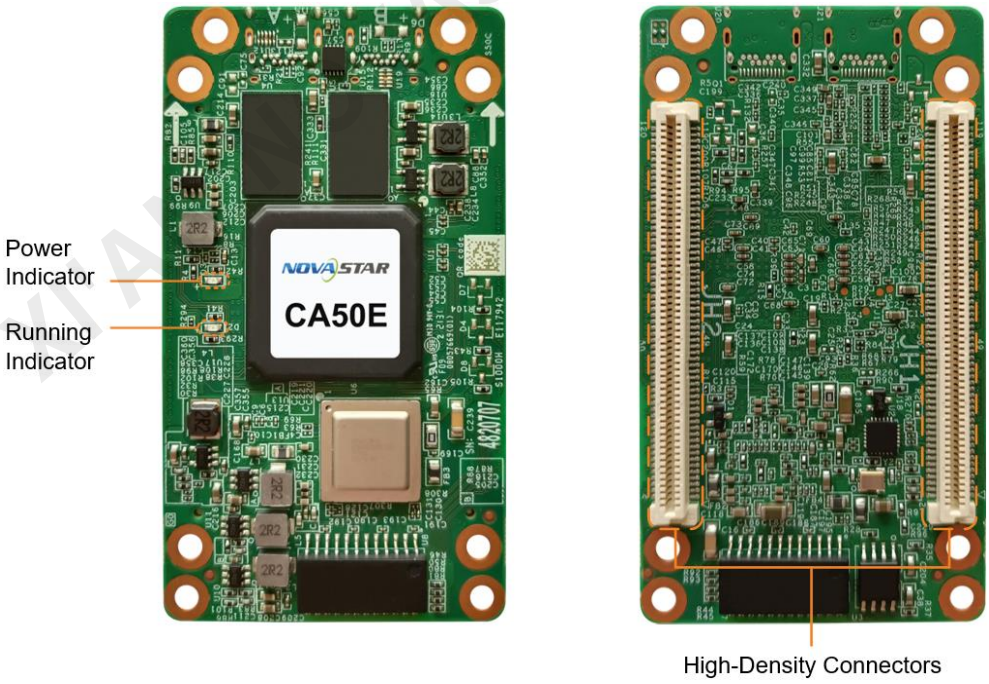
- Bite error detection
  The Ethernet port communication quality of the receiving card can be monitored and the error data packets can be recorded and reported to help users locate the faults and troubleshoot network communication problems.
- Status detection of dual power supplies
  When two power supplies are used, their working status can be detected by the receiving card.
- LVDS transmission (dedicated firmware required)
  Low-voltage differential signaling (LVDS) transmission is used to reduce the number of data cables from the hub board to module, increase the transmission distance, and improve the signal transmission quality and electromagnetic compatibility (EMC).

Improvements to Reliability

- Dual card backup and status monitoring
  In an application requiring high reliability, two receiving cards can be mounted onto a single hub board for backup. When the primary receiving card fails, the backup card can serve immediately to ensure uninterrupted operation of the display.

  The working status of the primary and backup receiving cards can be monitored. When either of them fails, the information is reported actively to the control computer or the controller.
- Loop backup
  The receiving card and controller form a loop via the primary and backup line connections. When a fault occurs at a location of the lines, the screen can still display the image normally.
- Dual backup of configuration parameters
  The receiving card configuration parameters are stored in the application area and factory area of the receiving card at the same time. Users usually use the configuration parameters in the application area. If necessary, users can restore the configuration parameters in the factory area to the application area.
- Dual program backup
  Two copies of firmware program are stored in the application area of the receiving card at the factory to avoid the problem that the receiving card may get stuck abnormally during program update.
- One-click firmware program learning
  The cabinet firmware program and configuration file can be coped to other cabinets with one click to help quickly complete cabinet configuration.

Appearance



All product pictures shown in this document are for illustration purpose only. Actual product may vary.

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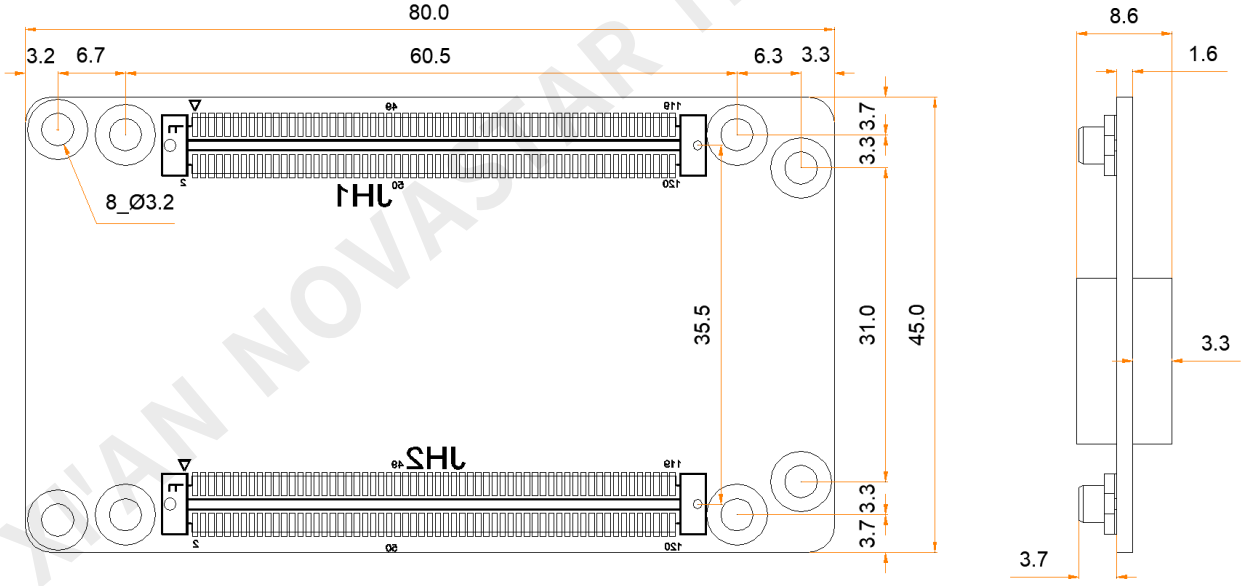
Indicators

Indicator	Color	Status	Description
Running indicator	Green	Flashing once every 1s	The receiving card is functioning normally. Ethernet cable connection is normal, and video source input is available.
		Flashing once every 3s	Ethernet cable connection is abnormal.
		Flashing 3 times every 0.5s	Ethernet cable connection is normal, but no video source input is available.
		Flashing once every 0.2s	The receiving card failed to load the program in the application area and is now using the backup program.
		Flashing 8 times every 0.5s	A redundancy switchover occurred on the Ethernet port and the loop backup has taken effect.
		Flashing 3 times every 2s	The Cabinet Finder function has taken effect.
Power indicator	Red	Always on	The power input is normal.

Dimensions

The board thickness is not greater than 2.0 mm, and the total thickness (board thickness + thickness of components on the top and bottom sides) is not greater than 9.2 mm. Ground connection (GND) is enabled for mounting holes.



Tolerance: ±0.3 Unit: mm

To make molds or trepan mounting holes, please contact NovaStar for a higher-precision structural drawing.

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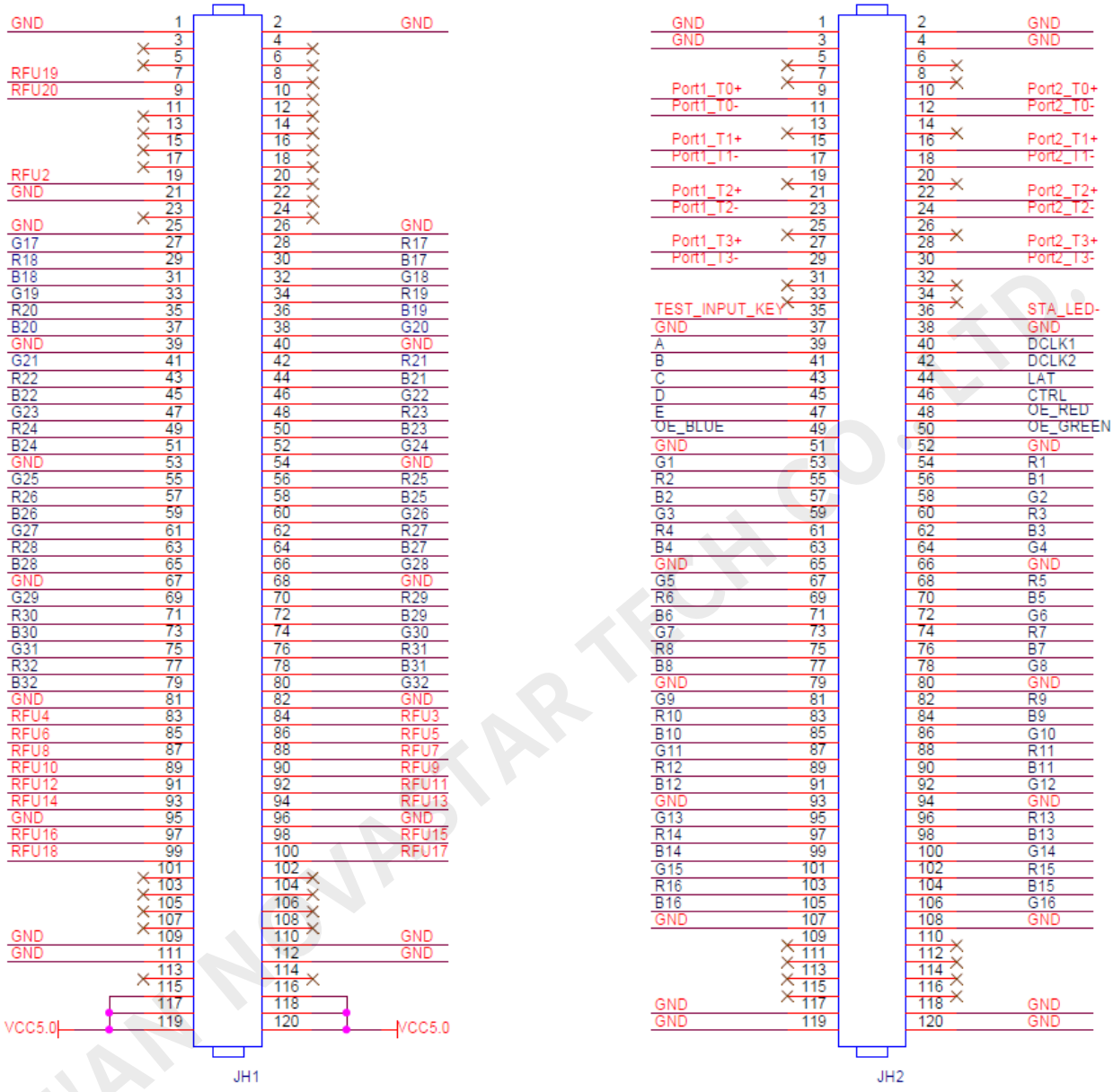
Pins

32 Groups of Parallel RGB Data



JH1					
/	GND	1	2	GND	/
/	NC	3	4	NC	/
/	NC	5	6	NC	/
/	RFU19	7	8	NC	/
/	RFU20	9	10	NC	/
/	NC	11	12	NC	/
/	NC	13	14	NC	/
/	NC	15	16	NC	/
/	NC	17	18	NC	/
/	RFU2	19	20	NC	/
/	GND	21	22	NC	/
/	NC	23	24	NC	/
/	GND	25	26	GND	/
/	G17	27	28	R17	/
/	R18	29	30	B17	/

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JH1					
/	B18	31	32	G18	/
/	G19	33	34	R19	/
/	R20	35	36	B19	/
/	B20	37	38	G20	/
/	GND	39	40	GND	/
/	G21	41	42	R21	/
/	R22	43	44	B21	/
/	B22	45	46	G22	/
/	G23	47	48	R23	/
/	R24	49	50	B23	/
/	B24	51	52	G24	/
/	GND	53	54	GND	/
/	G25	55	56	R25	/
/	R26	57	58	B25	/
/	B26	59	60	G26	/
/	G27	61	62	R27	/
/	R28	63	64	B27	/
/	B28	65	66	G28	/
/	GND	67	68	GND	/
/	G29	69	70	R29	/
/	R30	71	72	B29	/
/	B30	73	74	G30	/
/	G31	75	76	R31	/
/	R32	77	78	B31	/
/	B32	79	80	G32	/
/	GND	81	82	GND	/
/	RFU4	83	84	RFU3	/
/	RFU6	85	86	RFU5	/
/	RFU8	87	88	RFU7	/
/	RFU10	89	90	RFU9	/
/	RFU12	91	92	RFU11	/
/	RFU14	93	94	RFU13	/
/	GND	95	96	GND	/
/	RFU16	97	98	RFU15	/
/	RFU18	99	100	RFU17	/
/	NC	101	102	NC	/
/	NC	103	104	NC	/
/	NC	105	106	NC	/
/	NC	107	108	NC	/
/	GND	109	110	GND	/
/	GND	111	112	GND	/
/	NC	113	114	NC	/
/	VCC5.0	115	116	VCC5.0	/
/	VCC5.0	117	118	VCC5.0	/
/	VCC5.0	119	120	VCC5.0	/

JH2					
/	GND	1	2	GND	/
/	GND	3	4	GND	/
/	NC	5	6	NC	/
/	NC	7	8	NC	/
5G Ethernet port	Port1_T0+	9	10	Port2_T0+	5G Ethernet port
	Port1_T0-	11	12	Port2_T0-	
	NC	13	14	NC	
	Port1_T1+	15	16	Port2_T1+	
	Port1_T1-	17	18	Port2_T1-	
	NC	19	20	NC	
	Port1_T2+	21	22	Port2_T2+	

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JH2					
	Port1_T2-	23	24	Port2_T2-	
	NC	25	26	NC	
	Port1_T3+	27	28	Port2_T3+	
	Port1_T3-	29	30	Port2_T3-	
/	NC	31	32	NC	/
/	NC	33	34	NC	/
Test button	TEST_INPUT_KEY	35	36	STA_LED-	Running indicator (active low)
/	GND	37	38	GND	/
Line decoding signal	A	39	40	DCLK1	Shift clock output 1
Line decoding signal	B	41	42	DCLK2	Shift clock output 2
Line decoding signal	C	43	44	LAT	Latch signal output
Line decoding signal	D	45	46	CTRL	Afterglow control signal
Line decoding signal	E	47	48	OE_RED	Display enable signal
Display enable signal	OE_BLUE	49	50	OE_GREEN	Display enable signal
/	GND	51	52	GND	/
/	G1	53	54	R1	/
/	R2	55	56	B1	/
/	B2	57	58	G2	/
/	G3	59	60	R3	/
/	R4	61	62	B3	/
/	B4	63	64	G4	/
/	GND	65	66	GND	/
/	G5	67	68	R5	/
/	R6	69	70	B5	/
/	B6	71	72	G6	/
/	G7	73	74	R7	/
/	R8	75	76	B7	/
/	B8	77	78	G8	/
/	GND	79	80	GND	/
/	G9	81	82	R9	/
/	R10	83	84	B9	/
/	B10	85	86	G10	/
/	G11	87	88	R11	/
/	R12	89	90	B11	/
/	B12	91	92	G12	/
/	GND	93	94	GND	/
/	G13	95	96	R13	/
/	R14	97	98	B13	/
/	B14	99	100	G14	/
/	G15	101	102	R15	/
/	R16	103	104	B15	/
/	B16	105	106	G16	/
/	GND	107	108	GND	/
/	NC	109	110	NC	/
/	NC	111	112	NC	/
/	NC	113	114	NC	/
/	NC	115	116	NC	/
/	GND	117	118	GND	/
/	GND	119	120	GND	/

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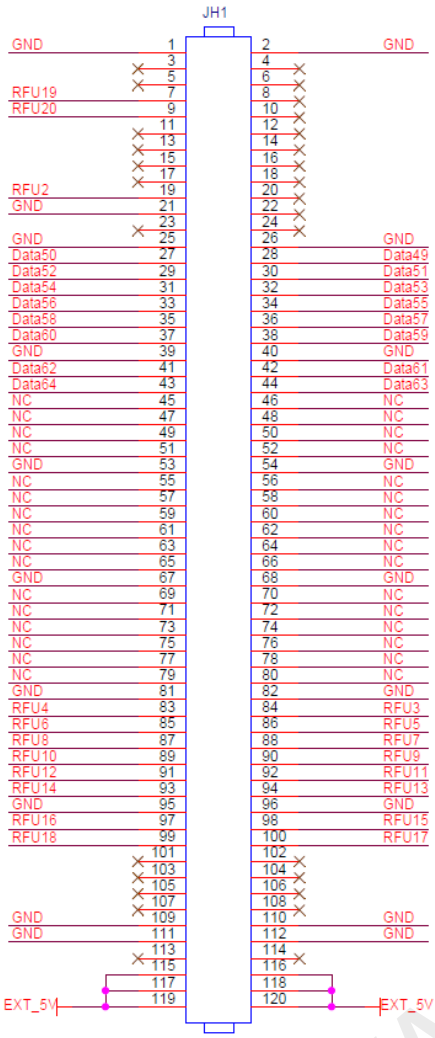
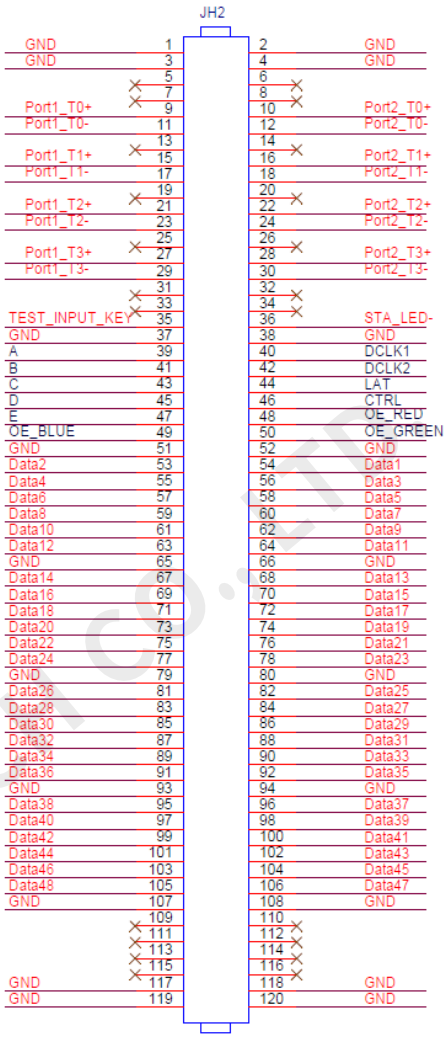
64 Groups of Serial Data





JH1					
/	GND	1	2	GND	/
/	NC	3	4	NC	/
/	NC	5	6	NC	/
/	RFU19	7	8	NC	/
/	RFU20	9	10	NC	/
/	NC	11	12	NC	/
/	NC	13	14	NC	/
/	NC	15	16	NC	/
/	NC	17	18	NC	/
/	RFU2	19	20	NC	/
/	GND	21	22	NC	/
/	NC	23	24	NC	/
/	GND	25	26	GND	/
/	Data50	27	28	Data49	/
/	Data52	29	30	Data51	/
/	Data54	31	32	Data53	/
/	Data56	33	34	Data55	/
/	Data58	35	36	Data57	/
/	Data60	37	38	Data59	/
/	GND	39	40	GND	/
/	Data62	41	42	Data61	/
/	Data64	43	44	Data63	/

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JH1					
/	NC	45	46	NC	/
/	NC	47	48	NC	/
/	NC	49	50	NC	/
/	NC	51	52	NC	/
/	GND	53	54	GND	/
/	NC	55	56	NC	/
/	NC	57	58	NC	/
/	NC	59	60	NC	/
/	NC	61	62	NC	/
/	NC	63	64	NC	/
/	NC	65	66	NC	/
/	GND	67	68	GND	/
/	NC	69	70	NC	/
/	NC	71	72	NC	/
/	NC	73	74	NC	/
/	NC	75	76	NC	/
/	NC	77	78	NC	/
/	NC	79	80	NC	/
/	GND	81	82	GND	/
/	RFU4	83	84	RFU3	/
/	RFU6	85	86	RFU5	/
/	RFU8	87	88	RFU7	/
/	RFU10	89	90	RFU9	/
/	RFU12	91	92	RFU11	/
/	RFU14	93	94	RFU13	/
/	GND	95	96	GND	/
/	RFU16	97	98	RFU15	/
/	RFU18	99	100	RFU17	/
/	NC	101	102	NC	/
/	NC	103	104	NC	/
/	NC	105	106	NC	/
/	NC	107	108	NC	/
/	GND	109	110	GND	/
/	GND	111	112	GND	/
/	NC	113	114	NC	/
/	EXT_5V	115	116	EXT_5V	/
/	EXT_5V	117	118	EXT_5V	/
/	EXT_5V	119	120	EXT_5V	/

JH2					
/	GND	1	2	GND	/
/	GND	3	4	GND	/
/	NC	5	6	NC	/
/	NC	7	8	NC	/
5G Ethernet port	Port1_T0+	9	10	Port2_T0+	5G Ethernet port
	Port1_T0-	11	12	Port2_T0-	
	NC	13	14	NC	
	Port1_T1+	15	16	Port2_T1+	
	Port1_T1-	17	18	Port2_T1-	
	NC	19	20	NC	
	Port1_T2+	21	22	Port2_T2+	
	Port1_T2-	23	24	Port2_T2-	
	NC	25	26	NC	

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JH2					
	Port1_T3+	27	28	Port2_T3+	
	Port1_T3-	29	30	Port2_T3-	
/	NC	31	32	NC	/
/	NC	33	34	NC	/
Test button	TEST_INPUT_KEY	35	36	STA_LED-	Running indicator (active low)
/	GND	37	38	GND	/
Line decoding signal	A	39	40	DCLK1	Shift clock output 1
Line decoding signal	B	41	42	DCLK2	Shift clock output 2
Line decoding signal	C	43	44	LAT	Latch signal output
Line decoding signal	D	45	46	CTRL	Afterglow control signal
Line decoding signal	E	47	48	OE_RED	Display enable signal
Display enable signal	OE_BLUE	49	50	OE_GREEN	Display enable signal
/	GND	51	52	GND	/
/	Data2	53	54	Data1	/
/	Data4	55	56	Data3	/
/	Data6	57	58	Data5	/
/	Data8	59	60	Data7	/
/	Data10	61	62	Data9	/
/	Data12	63	64	Data11	/
/	GND	65	66	GND	/
/	Data14	67	68	Data13	/
/	Data16	69	70	Data15	/
/	Data18	71	72	Data17	/
/	Data20	73	74	Data19	/
/	Data22	75	76	Data21	/
/	Data24	77	78	Data23	/
/	GND	79	80	GND	/
/	Data26	81	82	Data25	/
/	Data28	83	84	Data27	/
/	Data30	85	86	Data29	/
/	Data32	87	88	Data31	/
/	Data34	89	90	Data33	/
/	Data36	91	92	Data35	/
/	GND	93	94	GND	/
/	Data38	95	96	Data37	/
/	Data40	97	98	Data39	/
/	Data42	99	100	Data41	/
/	Data44	101	102	Data43	/
/	Data46	103	104	Data45	/
/	Data48	105	106	Data47	/
/	GND	107	108	GND	/
/	NC	109	110	NC	/
/	NC	111	112	NC	/
/	NC	113	114	NC	/
/	NC	115	116	NC	/
/	GND	117	118	GND	/
/	GND	119	120	GND	/

Note

The recommended power input is 5.0 V.

OE_RED, OE_GREEN and OE_BLUE are display enable signals. When RGB are not controlled separately, use OE_RED. When the PWM chip is used, they are used as GCLK signals.

In the mode of 128 groups of serial data, Data65–Data128 are multiplexed into Data1–Data64.

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Reference Design for Extended Functions

Pins for Extended Functions			
Pin	Recommended Module Flash Pin	Recommended Smart Module Pin	Description
RFU4	HUB_SPI_CLK	(Reserved)	Clock signal of serial pin
RFU6	HUB_SPI_CS	(Reserved)	CS signal of serial pin
RFU8	HUB_SPI_MOSI	/	Module Flash data storage input
	/	HUB_UART_TX	Smart module TX signal
RFU10	HUB_SPI_MISO	/	Module Flash data storage output
	/	HUB_UART_RX	Smart module RX signal
RFU3	HUB_CODE0		Module Flash BUS control pin
RFU5	HUB_CODE1		
RFU7	HUB_CODE2		
RFU9	HUB_CODE3		
RFU18	HUB_CODE4		
RFU11	HUB_H164_CSD		74HC164 data signal
RFU13	HUB_H164_CLK		
RFU14	POWER_STA1		Dual power supply detection signal
RFU16	POWER_STA2		
RFU15	MS_DATA		Dual card backup connection signal
RFU17	MS_ID		Dual card backup identifier signal

Note

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

Specifications

Maximum Resolution	768×512@60Hz (For 8-bit and 10-bit video sources) 512×480@60Hz (For 12-bit video sources)	
Electrical Specifications	Input voltage	DC 3.8 V to 5.5 V
	Rated current	1.35 A
	Rated power consumption	6.8 W
Operating Environment	Temperature	–20°C to +70°C
	Humidity	10% RH to 90% RH, non-condensing
Storage Environment	Temperature	–25°C to +125°C
	Humidity	0% RH to 95% RH, non-condensing
Physical Specifications	Dimensions	80.0 mm × 45.0 mm × 8.6 mm
	Net weight	25.5 g
Packing Information	Packing specifications	An antistatic bag and anti-collision foam are provided for each receiving card. Each packing box contains 40 receiving cards.
	Packing box dimensions	381.0 mm × 196.0 mm × 124.0 mm

The amount of current and power consumption may vary depending on various factors such as product settings, usage, and environment.

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