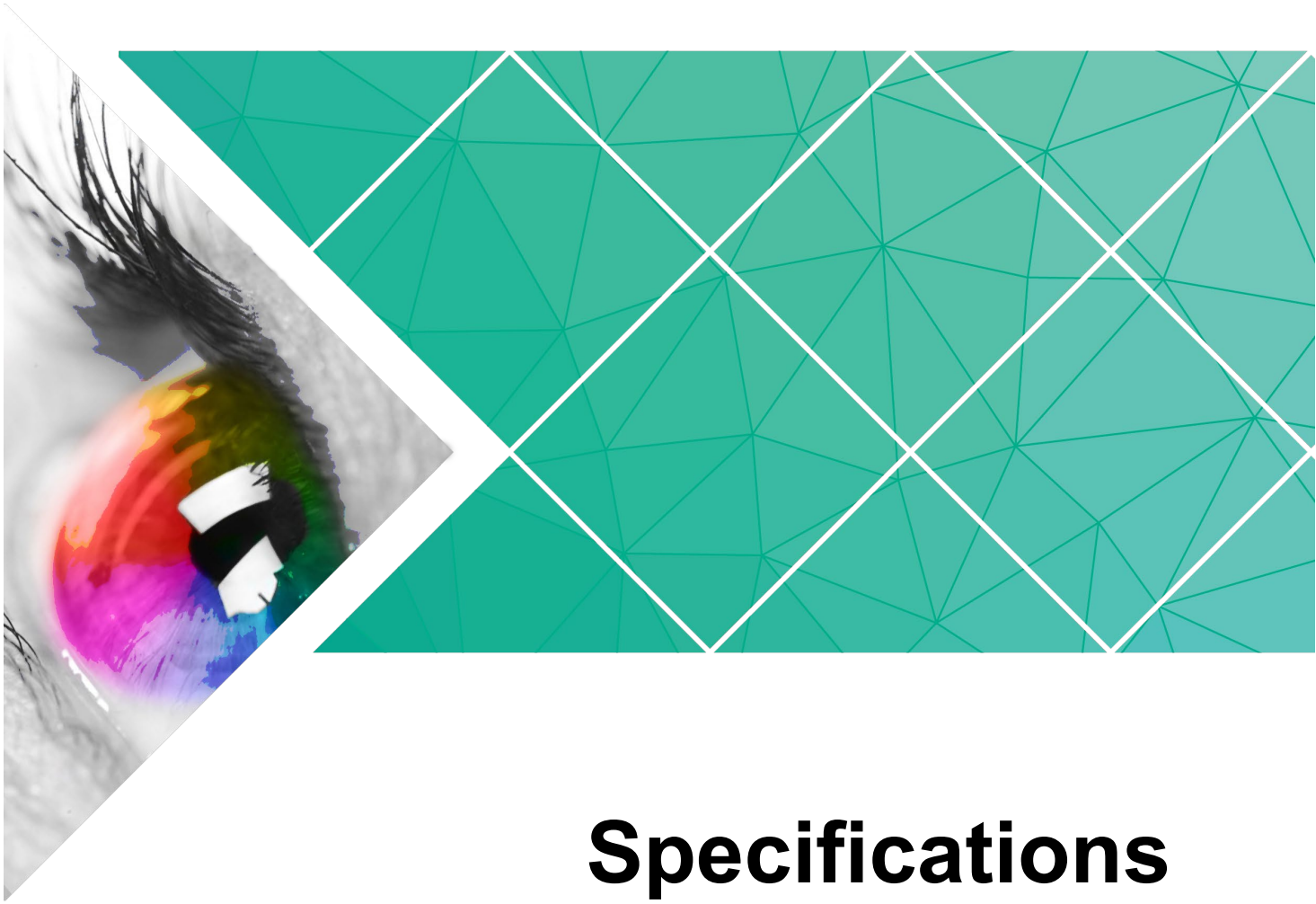
A9s

Receiving Card



Specifications

Document Version: V1.1.0

Document Number: NS110100653

Trademark

NOVASTAR is a trademark of Xi'an NovaStar Tech Co., Ltd.

Statement

You are welcome to use the product of Xi'an NovaStar Tech Co., Ltd. (hereinafter referred to as NovaStar). This document is intended to help you understand and use the product. For accuracy and reliability, NovaStar may make improvements and/or changes to this document at any time and without notice. If you experience any problems in use or have any suggestions, please contact us via contact info given in document. We will do our best to solve any issues, as well as evaluate and implement any suggestions.

Change History

Version	Release Date	Description
V1.1.0	2018-09-14	Optimized the quick seam correction function.
V1.0.0	2017-01-10	The first version.

Contents

1 Safety

This chapter illustrates safety of the A9s receiving card to ensure the product's storage, transport, installation and use safety.

Safety instructions are applicable to all personnel who come into contact with or use the product. Please pay attention to following points.

- Read through the instructions.
- Retain all instructions.
- Comply with all instructions.

Storage and Transport Safety

- Pay attention to dust and water prevention.
- Avoid long-term direct sunlight.
- Do not place the product in a position near fire and heat.
- Do not place the product in an area containing explosive materials.
- Do not place the product in a strong electromagnetic environment.
- Place the product in a stable position to prevent damage or personal injury caused by dropping.
- Save the packing box and materials for future storage and shipping of product. For maximum protection during storage and shipping, repack the product as it was originally packed at the factory.

Installation and Use Safety

- Only trained professionals may install the product.
- Plugging and unplugging operations are prohibited when the power is on.
- Ensure safe grounding of the product.
- Always wear a wrist band and insulating gloves.
- Do not place the product in an area that is frequently or strongly shaken.
- Perform regularly dust removal.
- Rather than having the product disassembled and maintained by non-certified professionals, please contact NovaStar for maintenance at any time.
- Replace faulty parts only with the spare parts supplied by NovaStar.

2 Overview

A9s is a high-end receiving card developed by NovaStar. It has a small size and features a large loading capacity, with a single card loading up to 512×512 (PWM IC) pixels.

The A9s supports pixel level brightness and chroma calibration by working with NovaLCT and NovaCLB to perform calibration on each pixel. It can effectively remove color discrepancies and greatly improve LED display image consistency. In addition, it also supports image rotation in 90° increments, creating a richer image and offering users the ultimate visual experience.

On-site setup, operation, and maintenance were all taken into account when designing the hardware and software of the A9s, allowing for an easier setup, more stable operation, and more efficient maintenance.

Advanced hardware design:

- The small hardware footprint is suitable to applications with limited cabinet space and small pixel pitch.
- Uses dust-resistant high-density connector to limit effects of dust and vibration, resulting in high stability and reliability.
- Integrated network transformer features simple design and improved magnetic compatibility, helping user’s products to successfully pass the EMC certification.

Useful software design:

- Supports LVDS transmission (supported by dedicated firmware program).
- Supports smart module (supported by dedicated firmware program).
- Supports quick seam correction.
- Supports 3D function.
- Supports auto module calibration.
- Supports Mapping function.
- Supports setting of pre-stored image on receiving card.
- Supports management of module's Flash.
- Supports voltage and temperature monitoring of card without use of peripherals.
- Supports monitoring of Ethernet cable communication status (supported by dedicated firmware program).
- Supports 5-pin LCD module.
- Supports image rotation in 90° increments.

3 Features

3.1 Improvements to Display Effect

Features	Description
Pixel level brightness and chroma calibration	Working with NovaLCT and NovaCLB, A9s supports brightness and chroma calibration on each pixel.
Image rotation in 90° increments (calibration not supported after rotation)	In NovaLCT, the image on the screen can be set to rotate in multiples of 90° (90°, 180°, 270° and 360°).
Quick seam correction	Bright and dark lines can be quickly corrected in NovaLCT to remove the seams between modules or cabinets.
3D function	In NovaLCT or operation panel of controllers which support 3D function, you can enable 3D function and set 3D parameters to allow LED screen to display 3D effects.

3.2 Improvements to Maintainability

Features	Description
Supports smart module (supported by dedicated firmware program).	The smart module is composed of Flash and MCU. Flash can store calibration coefficients and module information. MCU can communicate with the receiving card to monitor temperature, voltage and ribbon cable communication status for the module. Working with the driver chip, MCU also supports open circuit detection of LED. The smart module allows for a smaller monitoring unit, requiring no independent monitoring card and saving cabinet space.
LVDS transmission	Low-voltage differential signaling (LVDS)

Features	Description
(supported by dedicated firmware program)	transmission is used, which reduces the number of data cables that connect the HUB board to the module, increases the transmission distance, improves the signal transmission quality and electromagnetic compatibility, and better stabilizes the image output.
Auto module calibration	After the module has been replaced and power is supplied, the receiving card can automatically read the new module ID and calibration coefficients, and save them to the receiving card.
Mapping function	After enabling the Mapping function in NovaLCT, target cabinet will display the receiving card number and Ethernet port information, allowing user to view the receiving card’s location and wiring route.
Supports setting of pre-stored image on receiving card.	In NovaLCT, a specified image can be set as the LED screen startup image or as the image to be displayed on LED screen when the Ethernet cable is disconnected or no video source signal is available.
Management of module's Flash	In NovaLCT, the information stored in module's Flash can be managed.
Voltage and temperature monitoring of receiving card	The voltage and temperature of the receiving card can be monitored without using peripherals. The monitoring data can be checked in NovaLCT.
Supports LCD module.	Supports NovaStar's general 5-pin LCD module. The LCD module is connected to the HUB board to display temperature, voltage, single operating time and total operating time of the receiving card.
One-click to apply calibration coefficients saved in module's Flash	In the event of network outage, hold down the self-test button to read the calibration coefficients in module's Flash back to the receiving card.

3.3 Improvements to Hardware Reliability

Features	Description
Dual-card backup	In an environment with requirements for high reliability, two receiving cards can be mounted onto a single HUB board. In the case that main receiving card fails, the standby card will serve to ensure uninterrupted operation of the display.
Status detection of dual power supplies	Two power supplies can be simultaneously connected. Operating status of power supplies can be detected.

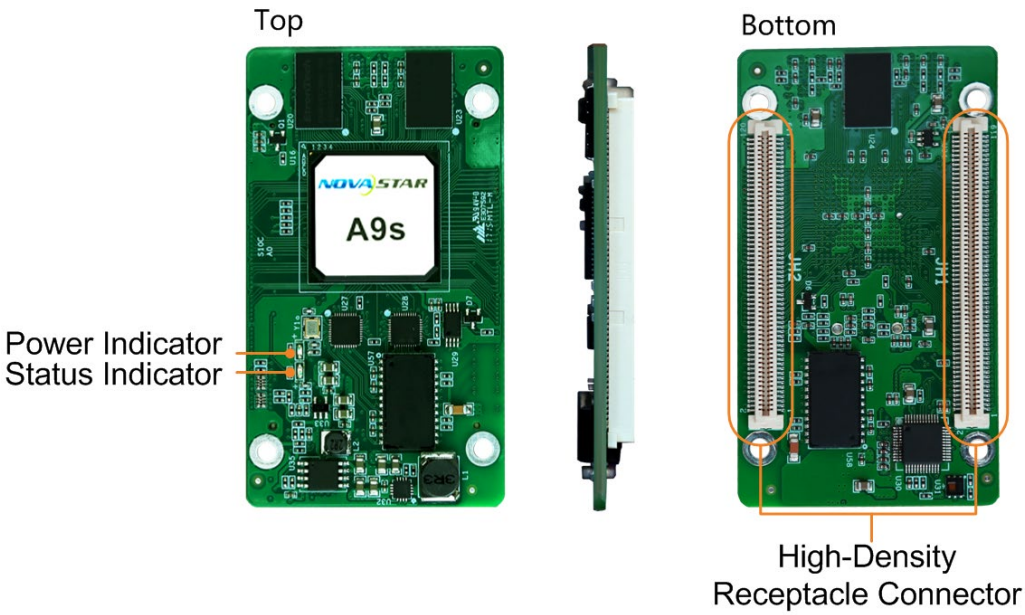
Features	Description
Loop backup	HUB's Ethernet port improves the reliability for the serial connection of the receiving card through main and backup redundant mechanism. If either main or backup serial connection lines fail, the other will begin to work to ensure normal operation of the display.

3.4 Improvements to Software Reliability

Features	Description
Readback of firmware version	In NovaLCT, the firmware versions of the receiving card can be read back.
Dual-backup of calibration coefficients	Calibration coefficients can be saved to both the factory partition and application partition at the same time. • Calibration coefficients in the factory partition are factory values and cannot be modified by users. • Calibration coefficients configured by users can be saved in the application partition and can be restored to the factory values by users.
Backup and readback of the receiving card configuration file	• In NovaLCT, the receiving card configuration parameters can be backed up to the receiving card. • In NovaLCT, the receiving card configuration parameters can be read back.

4 Hardware

4.1 Appearance



Product images provided in this file are for reference only. Actual products may differ from image shown.

Models of the high-density receptacle and plug used by A9s are shown in Table 4-1.

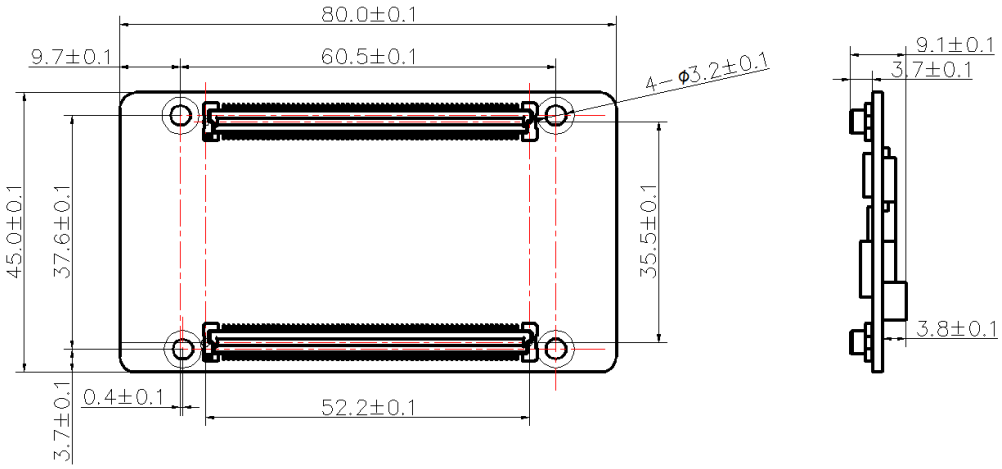
Table 4-1 Model of high-density connector

Type	Brand	Material Code
Receptacle	Amphenol FCI	10140609-121802LF
PLUG	Amphenol FCI	10140607-121802LF

4.2 Dimensions

PCB Board thickness is ≤ 2.0 mm, and the total thickness (PCB board thickness + thickness of both front panel and back panel) is ≤ 9.5 mm.

Unit of measurement on below chart is “mm”. Ground connection is enabled for mounting holes (GND).

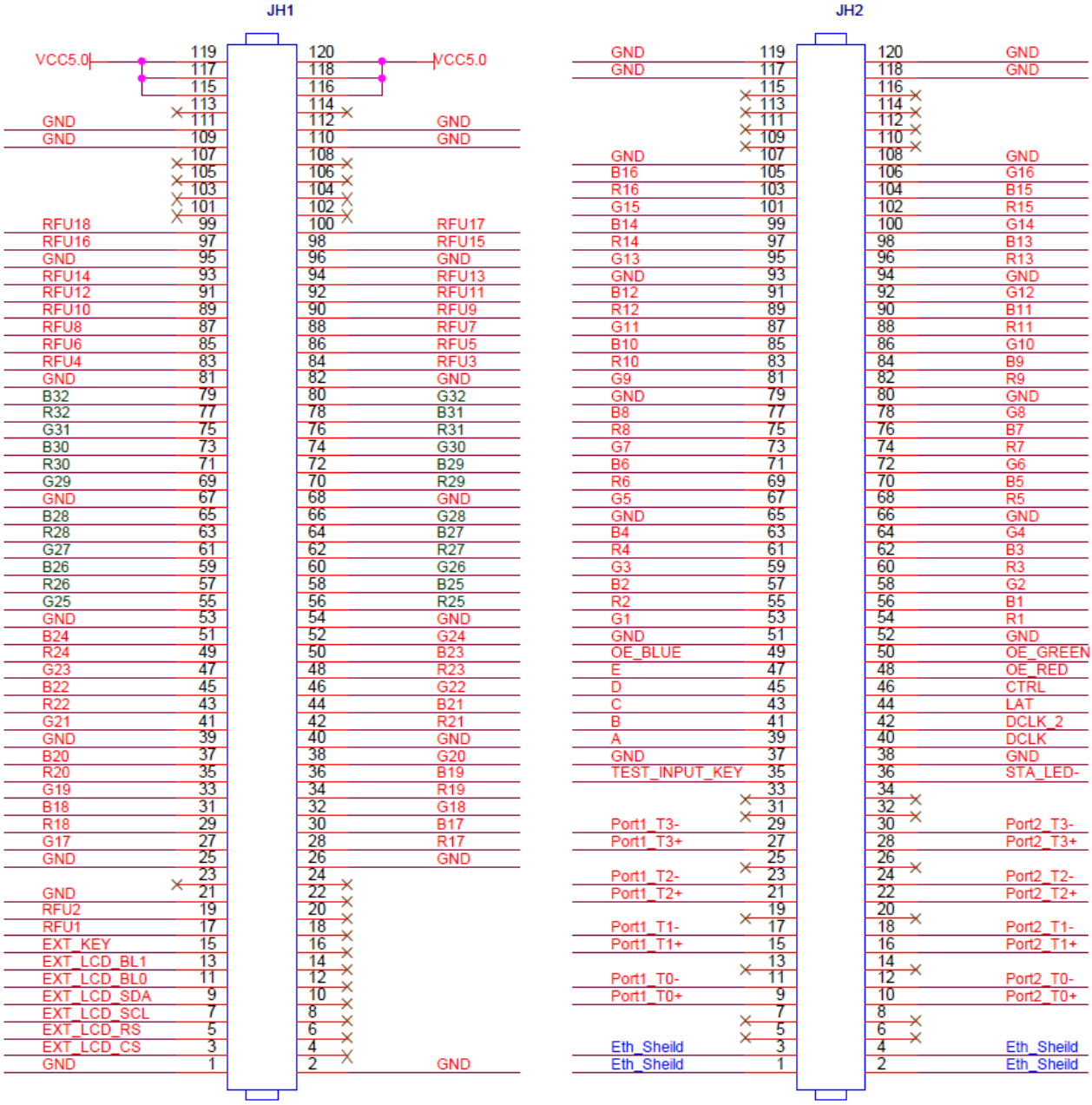


4.3 Indicators

Indicator	Status	Description
Status indicator (green)	Flashing every other 1s.	Receiving card is functioning normally. Ethernet cable connection is normal, and video source input is available.
	Flashing every other 3s.	Receiving card is functioning normally, but Ethernet cable connection is abnormal.
	Rapidly flashing for 3 times every other 3s.	Receiving card is functioning normally. Ethernet cable connection is normal, but no video source input is available.
	Rapidly flashing every other 0.5s.	Program loading fails in normal operating state, currently loading backup operating program.
	Rapidly flashing for 8 times every other 1s.	Sending card's backup Ethernet port is now active. Receiving card is functioning normally.
Power indicator (red)	Always on	It is always on after the power is on.

4.4 Pin Definition (Top)

4.4.1 Pins for Parallel Output of RGB Data (32 Groups)



JH1							
		GND	1	2	GND		
LCD	CS signal of LCD	EXT_LCD_CS	3	4	NC		
	RS signal of LCD	EXT_LCD_RS	5	6	NC		
	Clock signal of LCD	EXT_LCD_SCL	7	8	NC		
	Data signal of LCD	EXT_LCD_SDA	9	10	NC		
	Backlight signal 1 of LCD	EXT_LCD_BL0	11	12	NC		

JH1							
	Backlight signal 2 of LCD	EXT_LCD_BL1	13	14	NC		
	LCD control button	EXT_KEY	15	16	NC		
Note 4	/	RFU1	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	/	
	/	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		
Note 4	/	RFU4	83	84	RFU3	/	Note 4
	/	RFU6	85	86	RFU5	/	
	/	RFU8	87	88	RFU7	/	
	/	RFU10	89	90	RFU9	/	
	/	RFU12	91	92	RFU11	/	
	/	RFU14	93	94	RFU13	/	
		GND	95	96	GND		
Note 4	/	RFU16	97	98	RFU15	/	Note 4
	/	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		
Note 1		VCC	115	116	VCC		Note 1
		VCC	117	118	VCC		
		VCC	119	120	VCC		

JH2							
	Shield grounding	Eth_Shield	1	2	Eth_Shield	Shield grounding	
	Shield grounding	Eth_Shield	3	4	Eth_Shield	Shield grounding	
		NC	5	6	NC		
		NC	7	8	NC		
Gigabit Ethernet port	/	Port1_T0+	9	10	Port2_T0+	/	Gigabit 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		
	/	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-	Operating indicator	Note 2
		GND	37	38	GND		
	Line decoding signal	A	39	40	DCLK	1st shift clock output	
		B	41	42	DCLK_2	2nd shift clock output	
		C	43	44	LAT	Latch signal output	
		D	45	46	CTRL	Afterglow control signal	
		E	47	48	OE_RED	Display enable	Note 3
Note 3	Display enable	OE_BLUE	49	50	OE_GREEN	Display enable	
		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		

JH2							
		NC	111	112	NC		
		NC	113	114	NC		
		NC	115	116	NC		
		GND	117	118	GND		
		GND	119	120	GND		

4.4.2 Pins for Serial Data Output (64 Groups)

JH1							
		GND	1	2	GND		
LCD	CS signal of LCD	EXT_LCD_CS	3	4	NC		
	RS signal of LCD	EXT_LCD_RS	5	6	NC		

JH1							
	Clock signal of LCD	EXT_LCD_SCL	7	8	NC		
	Data signal of LCD	EXT_LCD_SDA	9	10	NC		
	Backlight signal 1 of LCD	EXT_LCD_BL0	11	12	NC		
	Backlight signal 2 of LCD	EXT_LCD_BL1	13	14	NC		
	LCD control button	EXT_KEY	15	16	NC		
Note 4	/	RFU1	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	/	
		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		
Note 4	/	RFU4	83	84	RFU3	/	Note 4
	/	RFU6	85	86	RFU5	/	
	/	RFU8	87	88	RFU7	/	
	/	RFU10	89	90	RFU9	/	
	/	RFU12	91	92	RFU11	/	
	/	RFU14	93	94	RFU13	/	
		GND	95	96	GND		
Note 4	/	RFU16	97	98	RFU15	/	Note 4
	/	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		

JH1							
Note 1		VCC	115	116	VCC		Note 1
		VCC	117	118	VCC		
		VCC	119	120	VCC		

JH2							
Gigabit Ethernet port	Shield grounding	Eth_Shield	1	2	Eth_Shield	Shield grounding	Gigabit Ethernet port
	Shield grounding	Eth_Shield	3	4	Eth_Shield	Shield grounding	
		NC	5	6	NC		
		NC	7	8	NC		
	/	Port1_T0+	9	10	Port2_T0+	/	
	/	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		
	/	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-	Operating indicator	Note 2
		GND	37	38	GND		
	Line decoding signal	A	39	40	DCLK	1st shift clock output	
		B	41	42	DCLK_2	2nd shift clock output	
		C	43	44	LAT	Latch signal output	
		D	45	46	CTRL	Afterglow control signal	
	Line decoding	E	47	48	OE_RED	Display enable	Note 3
Note 3	Display enable	OE_BLUE	49	50	OE_GREEN	Display enable	
		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	/	

JH2							
	/	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 1. Voltage ranging from 3.3 V to 5.5 V is recommended for input power (VCC).

Note 2. The operating indicator pin is active-low.

Note 3. OE_RED, OE_GREEN and OE_BLUE are display enabled pins. In case that OE_RGB are not controlled separately, use OE_RED. When PWM chip is used, GCLK signal is enabled.

Note 4. RFU 1–18 are the reserved pins for extended functions. For details, see “4.4.3 Extended Functions Design”.

4.4.3 Extended Functions Design

Description of Pins for Extended Functions			
Extended Pin	Recommended Smart Module Pin	Recommended Module Flash Pin	Description
RFU1	Reserved	Reserved	Reserved pin that connects to MCU
RFU2	Reserved	Reserved	Reserved pin that connects to MCU
RFU3	HUB_CODE0	HUB_CODE0	Flash control pin 1
RFU4	HUB_SPI_CLK	HUB_SPI_CLK	Clock signal of the serial pin
RFU5	HUB_CODE1	HUB_CODE1	Flash control pin 2
RFU6	HUB_SPI_CS	HUB_SPI_CS	CS signal of the serial pin
RFU7	HUB_CODE2	HUB_CODE2	Flash control pin 3
RFU8	/	HUB_SPI_MOSI	Module Flash storage data input
	HUB_UART_TX	/	TX signal of the smart module
RFU9	HUB_CODE3	HUB_CODE3	Flash control pin 4
RFU10	/	HUB_SPI_MISO	Module Flash storage data output
	HUB_UART_RX	/	RX signal of the smart module
RFU11	HUB_H164_CSD	HUB_H164_CSD	74HC164 data signal
RFU12	/	/	/
RFU13	HUB_H164_CLK	HUB_H164_CLK	74HC164 clock signal
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

Description of Pins for Extended Functions			
RFU18	HUB_CODE4	HUB_CODE4	Flash control pin 5

Note: The RFU8 and RFU10 are signal multiplex extension pins. You can select only one pin from either the **Recommended Smart Module Pin** or the **Recommended Module Flash Pin** at the same time.

5 Firmware Update

Step 1 Visit www.novastar.tech to download the firmware update package and save it to PC.

Step 2 Run NovaLCT and choose **User > Advanced Synchronous System User Login** and log in.

Step 3 On the displayed page, type the secret code "**admin**" to enter the program loading page.

Step 4 Click **Browse** to select the program (the firmware update package you saved on PC) path and then click **Update**.

Step 5 (Optional) Click **Refresh** to check current hardware version information.

6 Specifications

Input voltage	DC 3.3 V–5.5 V
Rated current	0.5 A
Rated power consumption	2.5 W
Operating temperature	-20°C–70°C
Storage temperature	-25°C–125°C
Operating humidity	10% RH–90% RH
Dimensions	80.0 mm × 45.0 mm × 9.1 mm
Net weight	22.3 g
Certifications	• RoHS • EMC Class B
Packing	An antistatic bag and anti-collision foam are provided for each receiving card. Dimensions of the packing box: 378 mm × 190 mm × 120 mm. Each box contains 40 receiving cards.

A Acronyms and Abbreviations

E	
EMC	Electromagnetic Compatibility
F	
FPGA	Field-Programmable Gate Array
L	
LED	Light Emitting Diode
M	
MCU	Microcontroller Unit
R	
RCFG	Receiving Card Configuration

B Terms

Calibration coefficient

Calibration coefficients are a group of values, including brightness and chroma information, etc., generated for each LED after the LEDs are calibrated by calibration system.

Smart module

The smart module is composed of Flash and MCU.

Flash can store calibration coefficients and module information. MCU can communicate with the receiving card to monitor temperature, voltage and ribbon cable communication status for the module. Working with the driver chip, MCU also supports open circuit detection of LED.

The smart module allows for a smaller monitoring unit, requiring no independent monitoring card and saving cabinet space.

Mapping

After enabling the Mapping function in NovaLCT, target cabinet will display the receiving card number and Ethernet port information, allowing user to view the receiving card’s location and wiring route.

C FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.