

# **A8s** Receiving Card



# **Product Description**

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# **Change History**

Version	Release Date	Description
V1.1.0	2018-01-25	<ul> <li>Updated the loading capacity to 512×256 (PWM IC) pixels</li> </ul>
		Added the following functions:
		- HDR10
		<ul> <li>Low latency (customized function)</li> </ul>
		<ul> <li>LVDS transmission (customized function)</li> </ul>
V1.0.2	2017-06-23	Optimized the document structure and content.
V1.0.1	2017-02-10	Modified the data interface information.
V1.0.0	2017-01-10	First release

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This chapter illustrates the safety of the A8s receiving card to ensure products' storage, transport, packing and application safety. Safety description is applicable to all personnel that contact or use the products. Pay attention to following points:

- Read throughout the description.
- Save the whole description.
- Be complied with the whole description.

### 1.1 Storage and Transport Safety

- Pay attention to dust and water prevention.
- Avoid long-term direct sunlight.
- Do not place the products at the position near fire and heat.
- Do not place the products in an area containing explosive materials.
- Do not place the products in strong electromagnetic environment.
- Place the products at a stable position to prevent damage or personal injury caused by dropping.
- Save the packing box and materials which will come in handy if you ever have to ship your products. For maximum protection, repack your product as it was originally packed at the factory.

#### 1.2 Installation and Use Safety

- Only trained professionals may install the products.
- Do not insert and unplug (power cord plug) when the power is on.
- Ensure the safe grounding of the device.
- Always wear an anti-static wrist band and insulating gloves.
- Do not place the products in an area having more or strong shake.
- Perform dust removing regularly.
- Do not maintain the products without authorization but contact NovaStar as soon as possible.
- Replace spare parts only with the same parts supplied by NovaStar.



A8s is a high-end receiving card developed by NovaStar, featuring small size and large loading capacity with the single card loading capacity up to 512×256 (PWM IC) pixels.

A8s can work with the independent controller MCTRL R5, making display rotate at any angel. A8s can also work with the independent controller MCTRL4K featuring large loading capacity and support HDR10 compliant video input, realizing larger dynamic brightness range and larger color space, and making the image smoother.

A8s supports pixel level brightness and chroma calibration, which removes color difference effectively and improves display consistency of LED images. In addition, it also supports image rotation in 90° increments, creating richer images and improving visual experiences.

Software and hardware designs of the A8s concern the user deployment as well as operating and maintenance scenarios, enabling easier deployment, more stable operating and more efficient maintenance.

Advanced hardware design:

- Small size and thinner thickness save space for increasingly narrower cabinet space and smaller spacing between lamps.
- Use high-density connector which is resistant to dust and vibration and features high stability and high reliability.
- Assembly network transformer features simple design and improved magnetic compatibility, helping user's products to successfully pass the EMC authentication.

Useful software design:

- Support for HDR10
- Support for LVDS transmission (customized function)
- Support for low latency (customized function)
- Support for smart module (customized function)
- Support for auto module calibration
- Support for Mapping function
- Support for 18Bit+ grayscale output
- Support for ClearView
- Support for image rotation in 90° increments
- Support for pre-stored image setting of the receiving card

- Support for module Flash management
- Support for monitoring of temperature, power supply voltage
- Support for monitoring of Ethernet cable communication status (customized function)
- Support for 5-pin LCD module

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# **3** Characteristics

# 3.1 Improvement in Display Effect

	Characteristics	Description				
	Supporting HDR10	A8s can also work with the independent controller MCTRL4K featuring large loading capacity and support HDR10 compliant video input, realizing larger dynamic brightness range and larger color space, making the image smoother.				
	Supporting low latency (Customized function)	A8s can reduce the frame latency (for the module that the RAM is built within the driver IC) of the video source on the receiving card end to one frame.				
	Supporting pixel level brightness and chroma calibration	Pixel level brightness and chroma calibration on NovaLCT could remove color difference effectively, make the brightness and chroma of the whole screen highly consistent, and improve display effect.				
-	Supporting image rotation in 90° increments (Calibration of the rotated image not supported)	On NovaLCT, the image on the screen can be set to rotate in the multiples of 90° (90°, 180°, 270° and 360°).				
	Support 18Bit+ grayscale output	Enabling of 18 bit mode could improve LED display grayscale by 4 times, and therefore avoid grayscale loss caused by brightness reduction and make images finer.				
	Support ClearView	Enable ClearView on NovaLCT to adjust the texture, size and contrast in different area based on human visual system to make image more realistic.				
	Support arbitrary-angle rotation for the screen	Make A8s work together with MCTRL R5 and then set the screen on SmartLCT to make display rotate at any angel, show different shapes, and present changeable images.				

# 3.2 Improvement in Maintainability

Characteristics	Description			
Supporting the smart module (Customized function)	The smart module is composed of Flash and MCU. Flash could store calibration coefficients and module information. MCU could communicate with the receiving card to realize monitoring over temperature, voltage and wiring communication status, as well as LED error detection. The smart module could make monitoring unit smaller, requiring no independent monitoring card and saving cabinet space.			
Supporting LVDS transmission (Customized function)	The transmission mode of low-voltage differential signaling (LVDS) is used, which reduces the number of data cables that connect the receiving card's HUB board to the module, increases the transmission distance, improves the signal transmission quality, enhances the EMC effect, and better stabilizes the image output.			
Supporting module auto calibration	After the module has been replaced, the receiving card can automatically read the new module ID and calibration coefficient which could be saved to calibration system files.			
Supporting Mapping function	Enable the Mapping function on NovaLCT, then the target cabinet will display the cabinet number and Ethernet port information, and the user could get the receiving card's location and wiring route.			
Supporting stored image setting of the receiving card	On NovaLCT, the specified images could be set as the startup image and images used when there is no network or video source.			
Supporting module Flash management	On NovaLCT, the module Flash could be enabled.			
Supporting monitoring over temperature, voltage and wiring status	On NovaLCT, temperature, voltage and wiring status of the receiving card could be checked.			
Supporting LCD module	Support NovaStar's product 5-pin LCD module which is connected to HUB to display temperature, voltage, single operating time and total operating time of the receiving card.			
Support one-click module Flash calibration coefficient	In the event of network outage, hold down the self-test button to read the module Flash calibration coefficient back to the receiving card.			

# 3.3 Improvement in Hardware Reliability

Characteristics	Description			
Supporting dual-card backup	In the high-reliability environment, single HUB board could be populated with two A8s receiving cards. In case that the main receiving card fails, the standby one will serve in a timely manner to ensure normal operation of the display.			
Supporting dual-power backup & detection	Two power supplies could be simultaneously connected, and operating status of the power supplies could be detected.			
Supporting hot backup	<ul> <li>Hot backup is used to improve business and connection reliability:</li> <li>Device redundant backup: The device connected to the receiving card improves business reliability through main and standby redundant mechanism. Only the main device is running at a certain time. The standby device begins to work to ensure the normal operation of the display while the main device fails.</li> <li>Ethernet port redundant backup: HUB's Ethernet port improves the reliability for the serial connection of the receiving card through main and standby redundant mechanism. Among the main and standby serial connection lines, if one fails, the other will begin to work to ensure the normal operation of the display.</li> </ul>			

# 3.4 Improvement in Software Reliability

Characteristics	Description				
Supporting firmware read back	Information saved in the receiving card could be read back on the NovaLCT.				
Supporting dual-backup and restoring of the calibration coefficient	Calibration coefficients could be saved to both the factory area and application area at the same time. Calibration coefficients in the factory area is default as the delivery value, while the calibration coefficient in the application area could be modified or be restored to the factory reset by the user on NovaLCT.				
Supporting configuration parameter backup for the receiving card	The user could back up configuration parameters on NovaLCT.				



### 4.1 Appearance



Product images provided in this file are for reference only, and the actual products shall prevail.

Models of the high-density receptacle and plug used by A8s are shown in Table 4-1.

Table 4-1	Model	of high-density	/ connector

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

#### 4.2 Dimensions

Board thickness is not greater than 2.0mm, and the total thickness (board thickness + thickness of both front panel and back panel) is not greater than 7.5mm.

Unit of the dimension chart is "mm". Ground connection is enabled for location hole (GND).



## 4.3 Indicator

Indicator	Status	Description	
	Flash every other 1s.	The receiving card works normally, Ethernet cable connection is normal, and video source input is available.	
Status indicator	Flash every other 3s.	The receiving card works normally, while the Ethernet cable connection is abnormal.	
(green)	Rapidly flash for 3 times every other 3s.	The receiving card works normally, Ethernet cable connection is normal, while no video source input is available.	
101	Rapidly flash every other 0.5s.	Program loading fails in normal operating state, coming to the backup operating state.	
Status indicator (red)	Remain lit.	It remains lit after the power is on.	
	<u>.</u>	<u>.</u>	

## 4.4 Definition of the Data Interface (Top)

#### 4.4.1 32-Group Parallel Data Interface



JH1								
		GND	1	2	GND			
	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			
LCD	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 5	/	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	/	
Note 2	/	G19	33	34	R19	/	Note 2
	/	R20	35	36	B19	/	
	/	B20	37	38	G20	/	
		GND	39	40	GND		
	/	G21	41	42	R21	/	
	/	R22	43	44	B21	/	
	/	B22	45	46	G22	/	
Note 2	/	G23	47	48	R23	/	Note 2
	/	R24	49	50	B23		
	/	B24	51	52	G24	/	
		GND	53	54	GND		
	/	G25	55	56	R25		
	/	R26	57	58	B25		
	/	B26	59	60	G26		
Note 2	/	G27	61	62	R27	/	Note 2
	/	R28	63	64	B27	/	
	/	B28	65	66	G28	/	
		GND	67	68	GND		
	/	G29	69	70	R29	/	
	/	R30	71	72	B29	/	
	/	B30	73	74	G30	/	
Note 2	/	G31	75	76	R31	/	Note 2
	/	R32	77	78	B31	/	
	/	B32	79	80	G32	/	
		GND	81	82	GND		
	/	RFU4	83	84	RFU3	/	
	/	RFU6	85	86	RFU5	/	
	/	RFU8	87	88	RFU7	/	
Note 5	/	RFU10	89	90	RFU9	/	Note 5
	1	RFU12	91	92	RFU11	/	
	/	RFU14	93	94	RFU13	/	
		GND	95	96	GND		
	1	RFU16	97	98	RFU15	/	Nists F
Note 5		RFU18	99	100	RFU17	/	Note 5
		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		
		VCC	115	116	VCC		
Note 1		VCC	117	118	VCC		Note 1
		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		

	/	Port1_T0+	9	10	Port2_T0+	/	
	/	Port1_T0-	11	12	Port2_T0-	/	
		NC	13	14	NC		
	/	Port1_T1+	15	16	Port2_T1+	/	
Gigabit	/	Port1_T1-	17	18	Port2_T1-	/	Gigabit
Ethernet		NC	19	20	NC		Ethernet
port	/	Port1 T2+	21	22	Port2 T2+	/	port
	/	Port1 T2-	23	24	Port2 T2-	/	
		NC	25	26	NC		
	1	Port1_T3+	27	28	Port2 T3+	1	
	/	Port1_T3-	29	30	Port2 T3-	,	-
	1	NC	31	32	NC	1	
		NC	33	3/	NC		
	Test button	TEST INPLIT KEY	35	36		Operating	Note 3
			37	38		Operating	Note 5
		GND	57	50	GND		
	Line coding signal	А	39	40	DCLK	Shift clock output in the first route	
	Line coding signal	В	41	42	DCLK_2	Shift clock output in the second route	
	Line coding signal	С	43	44	LAT	Locking of the signal output	
	Line coding signal	D	45	46	CTRL	Afterglow control signal	
	Line coding signal	E	47	48	OE_RED	Display enabled	Note 4
Note 4	Display enabled	OE_BLUE	49	50	OE_GREEN	Display enabled	
		GND	51	52	GND		
	/	G1	53	54	R1	/	
	/	R2	55	56	B1	/	
	/	B2	57	58	G2	/	
Note 2	/	G3	59	60	R3		Note 2
	/	R4	61	62	B3	/	
	/	B4	63	64	G4	/	
		GND	65	66	GND		
	1	G5	67	68	R5	1	
		R6	69	70	B5		
		B6	71	72	G6	,	
Note 2		G7	73	74	R7	/	Note 2
		R8	75	76	B7	/	-
		B8	77	78	G8	/	
		GND	79	80	GND	1	
		GQ	81	82	PQ	1	
		R10	82	84	RO	1	
		R10	85	86	C10	1	
Note 2	/		00	00	010	1	Note 2
	/		07	00		/	
	/	RIZ	89	90	BII	/	
	1	BI2	91	92	G12	1	
	,	GND	93	94	GND	1	
	/	G13	95	96	R13	/	
	/	K14	97	98	B13	/	
Note 2	/	B14	99	100	G14	/	Note 2
	/	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	

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

- Note 2. RGB data groups must be used in group.
- Note 3. Operating indicator that meets low level is valid.
- Note 4. OE\_RED, OE\_GREEN and OE\_BLUE are display enabled pins. In case that OE\_RGB are not controlled separately, OE\_RED signal is applied. When PWM chip is used, GCLK signal is enabled.
- Note 5. RFU1–18 are the reserved extended function interfaces. Please refer to "4.4.3 Reference Design for Expandable Interfaces".

#### 4.4.2 64-Group Serial Data Interface



JH1							
		GND	1	2	GND		
	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		
LOD	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 0	/	RFU1	17	18	NC		
Note 9	/	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	70	NC		
		NC	73	74	NC		
		NC	75	76	NC		
		NC	77	78	NC		
		NC	70	80	NC		
			79 Q1	82			
	1	BELIA	83	8/	REUS	1	
	/		95	96	DELIS	1	
	/		05	00	DEL17	1	
Note 9	/		07	00		/	Note 9
	/		09	90		1	-
		REUIZ	91	92		/	-
	/		93	94		/	
	/	GND	95	96		1	
Note 9	/	RFU10	97	98		/	Note 9
	/	RFU18	99	100	RFU17	/	
		NC	101	102	NC		
		NC	103	104	NC		
		NC	105	106	NC		
		NC	107	108	NC		1

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	GND	109	110	GND	
	GND	111	112	GND	
	NC	113	114	NC	
	VCC	115	116	VCC	
Note 6	VCC	117	118	VCC	Note 6
	VCC	119	120	VCC	

				JH2			
	Shield grounding	Eth Shield	1	2	Eth Shield	Shield grounding	
	Shield arounding	Eth Shield	3	4	Eth Shield	Shield arounding	
		NC	5	6	NC		
		NC	7	8	NC		
	/	Port1 T0+	9	10	Port2 T0+	/	
	1	Port1 T0-	11	12	Port2 T0-		
		NC	13	14	NC		Gigabit
Gigabit	/	Port1 T1+	15	16	Port2 T1+	/	Ethernet
Ethernet	1	Port1 T1-	17	18	Port2 T1-		port
pon		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 7
		GND	37	38	GND		
	Line coding signal	А	39	40	DCLK	Shift clock output in the first route	
	Line coding signal	в	41	42	DCLK_2	Shift clock output in the second route	
	Line coding signal	С	43	44	LAT	Locking of the signal output	
	Line coding signal	D	45	46	CTRL	Afterglow control signal	
	Line coding signal	Е	47	48	OE RED	Display enabled	
Note 8	Display enabled	OE_BLUE	49	50	OE_GREEN	Display enabled	Note 8
		GND	51	52	GND		
	$\sim$	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 6. Voltage ranging from 3.3V to 5.5V is recommended for input power (VCC).
- Note 7. Operating indicator that meets low level is valid.
- Note 8. OE\_RED, OE\_GREEN and OE\_BLUE are display enabled pins. In case that OE\_RGB are not controlled separately, OE\_RED is applied. While PWM chip is used, GCLK signal is enabled.
- Note 9. RFU1–18 are the reserved extended function interfaces. Please refer to "4.4.3 Reference Design for Expandable Interfaces".

#### 4.4.3 Reference Design for Expandable Interfaces

Expandable Interfaces				
Expandable Interface	Recommended Smart Module Interface	Recommended Module Flash Interface	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 interface 1	
RFU4	HUB_SPI_CLK	HUB_SPI_CLK	Clock signal of the serial interface	
RFU5	HUB_CODE1	HUB_CODE1	Flash control interface 2	
RFU6	HUB_SPI_CS	HUB_SPI_CS	CS signal of the serial interface	
RFU7	HUB_CODE2	HUB_CODE2	Flash control interface 3	
	/	HUB_SPI_MOSI	Module Flash storage data input	
RFUO	HUB_UART_TX	/	TX signal of the smart module	
RFU9	HUB_CODE3	HUB_CODE3	Flash control interface 4	
DEL140	/	HUB_SPI_MISO	Module Flash storage data output	
REUTU	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	1Dual-power detection signal 1	
RFU15	MS_DATA	MS_DATA	Dual-card backup connection signal	
RFU16	POWER_STA2	POWER_STA2	2Dual-power detection signal 2	

RFU17	MS_ID	MS_ID	Dual-card backup identification signal
RFU18	HUB_CODE4	HUB_CODE4	Flash control interface 5

Description:

RFU8 and RFU10 are signal multiplexing expandable interfaces for which the interfaces of either **Recommended Smart Module Interface** or **Recommended Module Flash Interface** can be selected at a time.



Program download method:

Visit www.novastar.tech and choose Download > Firmware. On the Firmware

www.novastar.tech





	Input voltage	DC 3.3 V–5.5 V
	Rated current	0.6 A
	Rated power consumption	3.0 W
	Operating temperature	-20°C–70°C
	Storage temperature	-25°C–125°C
	Operating humidity	10% RH–90% RH
	Dimension	70.0 mm × 45.0 mm × 7.3 mm
	Net weight	17.3 g
	Certification	• EMC Class B • RoHS
	Packing	The antistatic bag and anti-collision foam are prepared for each receiving card.
	7	120 mm, each of 40 receiving cards.
1'A		

Δ

# Acronyms and Abbreviations

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



#### 18Bit+

Specify the grayscale of LED displays. Enabling 18 bit mode on NovaLCT could improve LED display grayscale by 4 times, and therefore avoid grayscale loss caused by brightness reduction and make images finer.

#### **ClearView**

Display screen effects. Enable ClearView on NovaLCT to adjust the texture, size and contrast in different area based on human visual system to make image more realistic.

#### **Calibration coefficient**

Calibration system generates a group of values for each LED lamp, including information about brightness and chroma. After display calibration, the calibration values of each lamp are just the calibration coefficient.

#### Smart module

The smart module is composed of Flash and MCU.

Flash could store calibration coefficients and module information. MCU could communicate with the receiving card to realize monitoring over temperature, voltage and wiring communication status, as well as LED error detection.

The smart module could make monitoring unit smaller, requiring no independent monitoring card and saving cabinet space.

#### Mapping

After the Mapping function is enabled on NovaLCT, the target cabinet will display the cabinet number and Ethernet port information, and the user could get the receiving card's location and wiring route.

#### **Error detection**

Perform status detection for each LED lamp. If the LED lamp fails, the user could notify in a timely manner upon monitoring system.