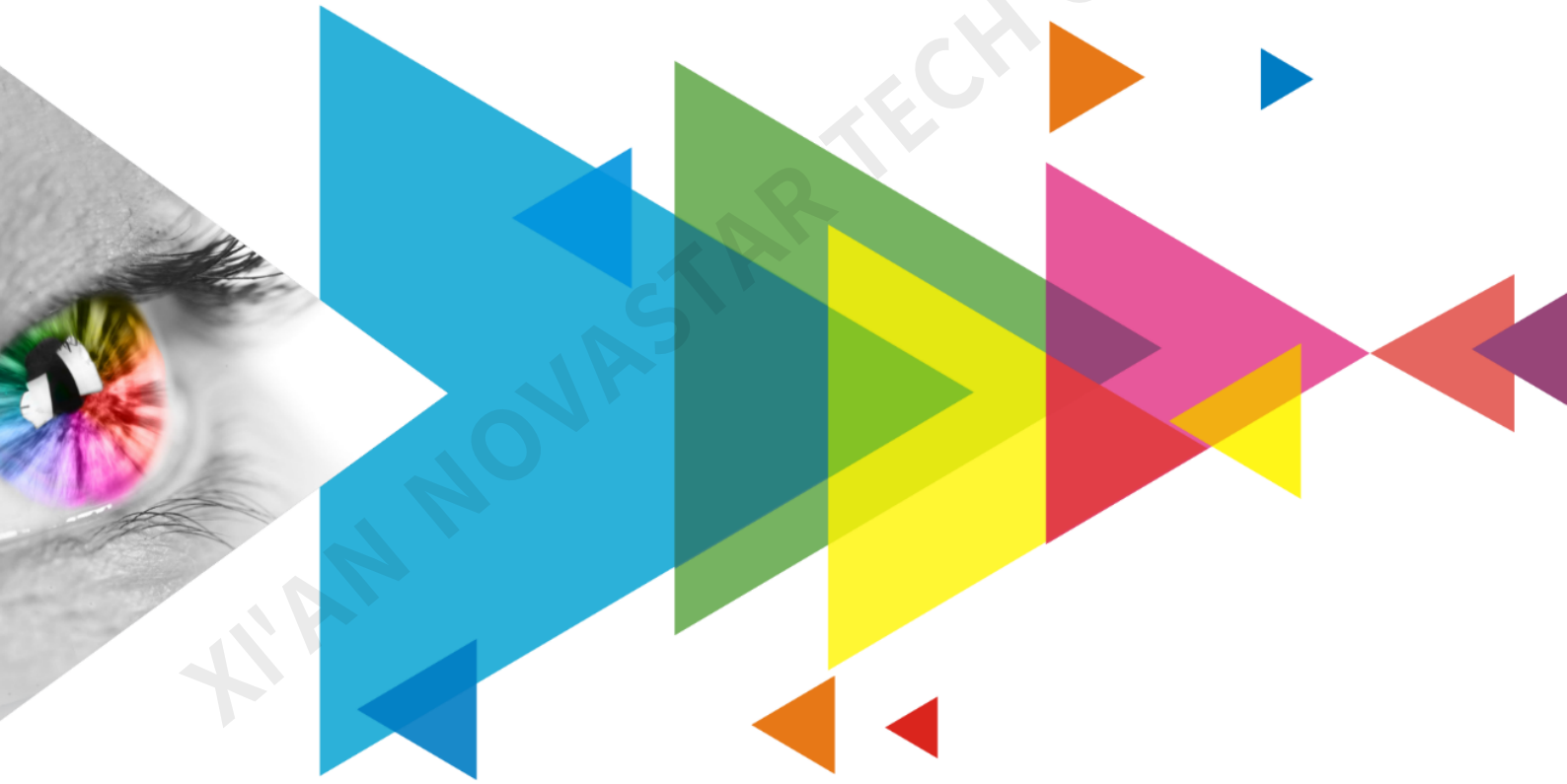
# A9s

## Receiving Card



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Specifications

# Change History

| Document Version | Release Date | Description |
|---|---|---|
| V1.1.3 | 2021-07-30 | • Updated the description of features.<br>• Added the certification related description. |
| V1.1.2 | 2021-02-06 | Updated the appearance diagrams. |
| V1.1.1 | 2020-07-01 | • Updated the firmware version.<br>• Updated the indicator description.<br>• Updated the side dimensions diagram.<br>• Optimized the feature description.<br>• Optimized the pin description tables. |

# Introduction

The A9s is a high-end small receiving card developed by NovaStar. A single A9s loads up to 512×512 pixels (PWM IC). Supporting the pixel level brightness and chroma calibration, and 3D functions, the A9s can significantly improve the display effect and user experience.

The A9s 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. Thanks to its EMC Class B compliant hardware design, the A9s has improved electromagnetic compatibility and is suitable for various on-site setups.

# Features

## Improvements to Display Effect

- Pixel level brightness and chroma calibration
  Working with NovaLCT and calibration platform (CalCube MiniLED V1.1.0 or later recommended), the receiving card supports brightness and chroma calibration on each LED, which can effectively remove color discrepancies and greatly improve LED display brightness and chroma consistency, allowing for better image quality.
- Quick adjustment of dark or bright lines
  The dark or bright lines caused by splicing of cabinets or modules can be adjusted to improve the visual experience. This function is easy to use and the adjustment takes effect immediately.
- 3D function
  Working with the sending card that supports 3D function, the receiving card supports 3D image 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

- Smart module (dedicated firmware required)
  Working with the smart module, the receiving card supports module ID management, storage of calibration coefficients and module parameters, monitoring of module temperature, voltage and flat cable communication status, LED error detection, and recording of the module run time.

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- 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.
- Quick uploading of calibration coefficients
  The calibration coefficients can be quickly uploaded to the receiving card, improving efficiency greatly.
- 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.
- One click to apply calibration coefficients stored in module Flash
  For modules with flash memory, if the Ethernet cable is disconnected, users can hold down the self-test button on the cabinet to upload the calibration coefficients in the flash memory of the module to the receiving card.
- Mapping function
  The cabinets display the receiving card number and Ethernet port information, allowing users to easily obtain the locations and connection topology of receiving cards.
- Setting of a pre-stored image in receiving card
  The image displayed on the screen during startup, or displayed when the Ethernet cable is disconnected or there is no video signal can be customized.
- Temperature and voltage monitoring
  The temperature and voltage of the receiving card can be monitored without using peripherals.
- Cabinet LCD
  The LCD module connected to the cabinet can display the temperature, voltage, single run time and total run time of the receiving card.
- Status detection of dual power supplies
  When two power supplies are connected, their working status can be detected by the receiving card.
- Firmware program readback
  The firmware program of the receiving card can be read back and saved to the local computer.
  NovaLCT V5.2.0 or later is required.
- Configuration parameter readback
  The configuration parameters of the receiving card can be read back and saved to the local computer.
- 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 with requirements for high reliability, two receiving cards can be mounted onto a single hub board for backup. In the case that the primary receiving card fails, the backup card will serve to ensure uninterrupted operation of the display.

  The working status of the primary and backup receiving cards can be monitored in NovaLCT V5.2.0 or later.
- Loop backup
  The receiving cards and the sending card form a loop via the primary and backup line connections. If 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 receiving card at the factory to avoid the problem that the receiving card may get stuck due to program update exception.
- Dual backup of calibration coefficients
  The calibration coefficients are stored in the application area and factory area of the receiving card at the same time. Users usually use the

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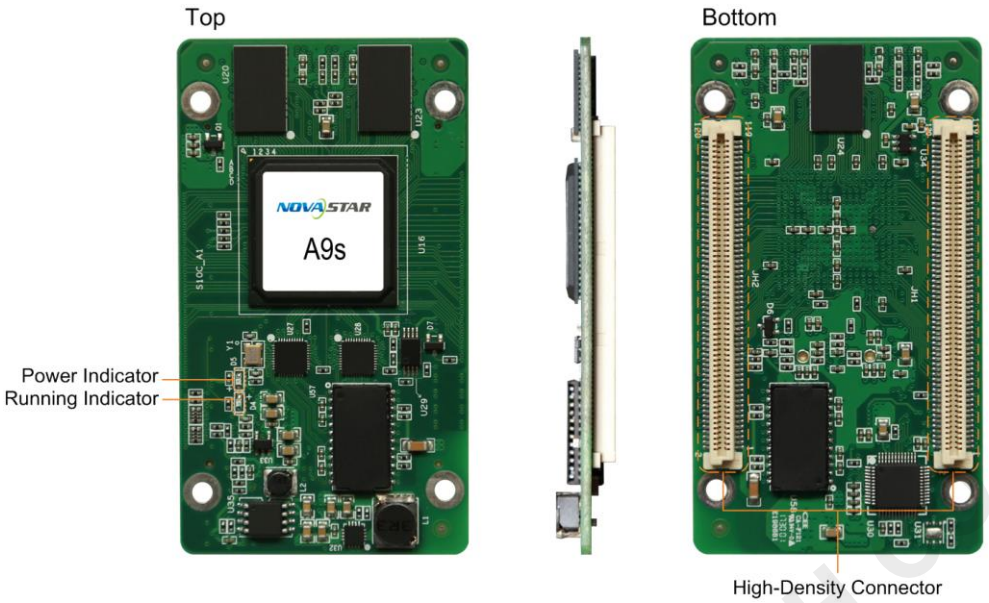
calibration coefficients in the application area. If necessary, users can restore the calibration coefficients in the factory area to the application area.

## Appearance




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

## 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. |
| 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 9.5 mm. Ground connection (GND) is enabled for mounting holes.

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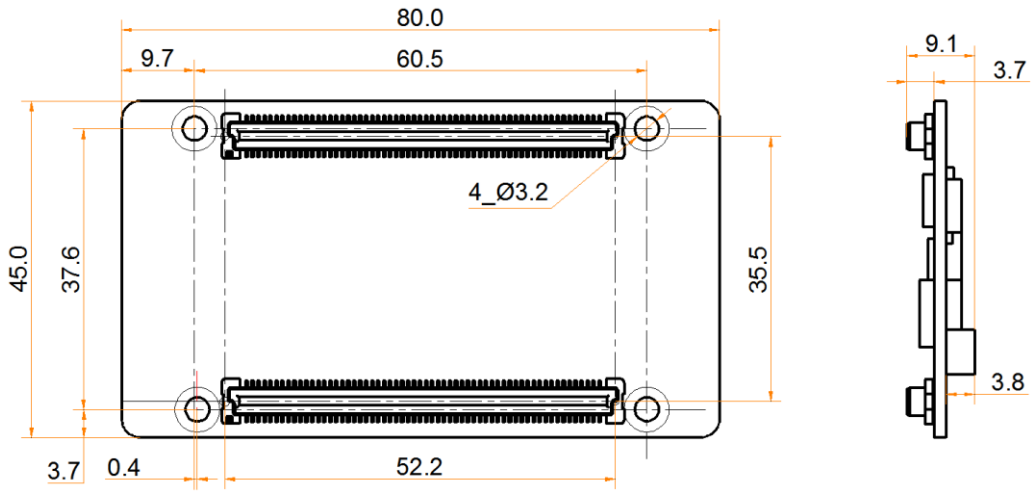


Tolerance: ±0.1 Unit: mm

**Note**

The distance between outer surfaces of the A9s and HUB boards after their high-density connectors fit together is 5.0 mm. A 5-mm copper pillar is recommended.

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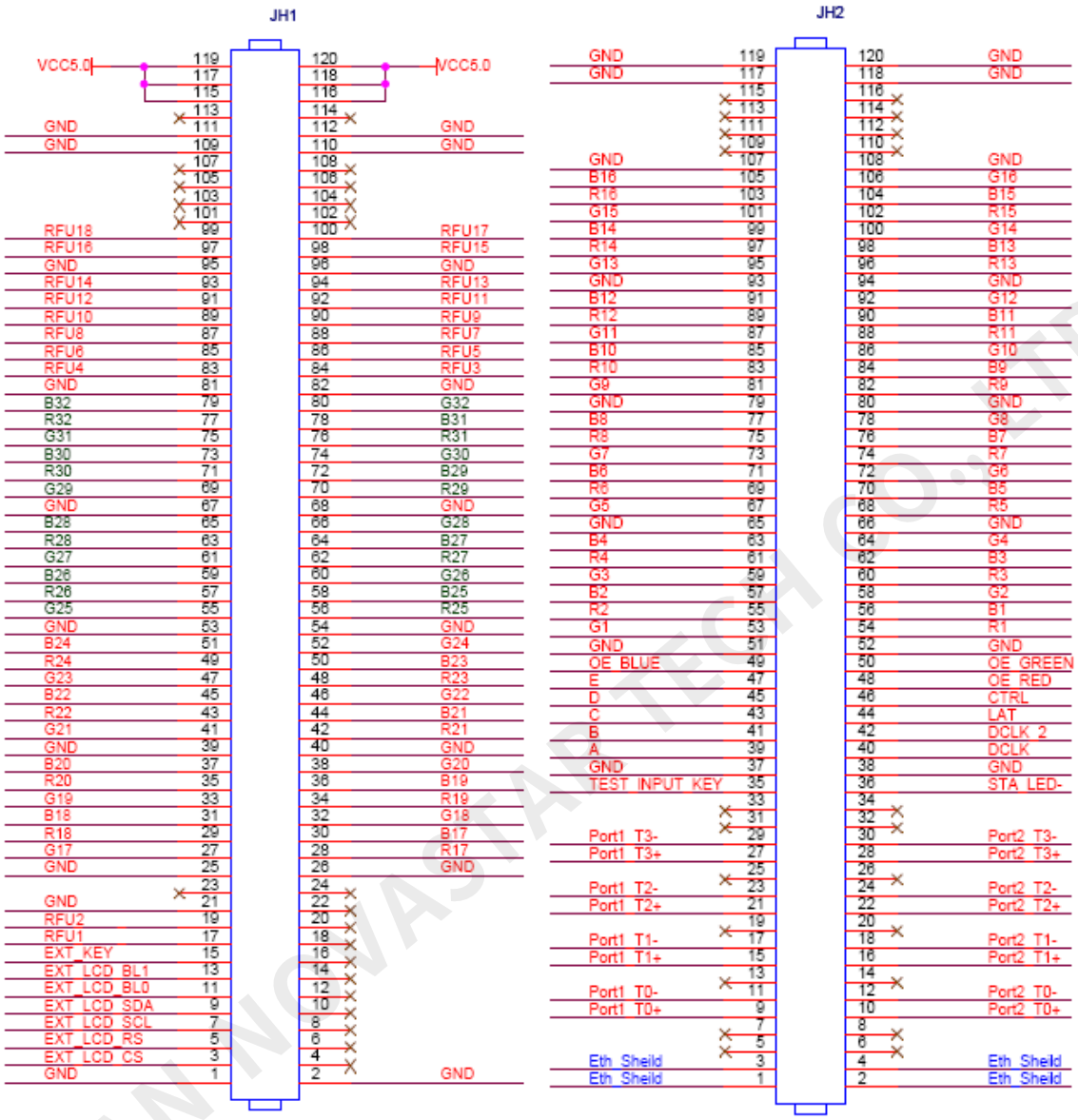
# Pins

## 32 Groups of Parallel RGB Data




| JH1 | | | | | |
|---|---|---|---|---|---|
| | GND | 1 | 2 | GND | |
| LCD CS signal | EXT_LCD_CS | 3 | 4 | NC | |
| LCD RS signal | EXT_LCD_RS | 5 | 6 | NC | |
| LCD clock signal | EXT_LCD_SCL | 7 | 8 | NC | |
| LCD data signal | EXT_LCD_SDA | 9 | 10 | NC | |
| LCD backlight signal 1 | EXT_LCD_BL0 | 11 | 12 | NC | |
| LCD backlight signal 2 | EXT_LCD_BL1 | 13 | 14 | NC | |
| LCD control button | EXT_KEY | 15 | 16 | NC | |
| / | 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 | / |

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| JH1 | | | | | |
|---|---|---|---|---|---|
| / | 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 | |
| | VCC | 115 | 116 | VCC | |
| | VCC | 117 | 118 | VCC | |
| | VCC | 119 | 120 | VCC | |

| JH2 | | | | | |
|---|---|---|---|---|---|
| Chassis ground | Eth_Sheild | 1 | 2 | Eth_Sheild | Chassis ground |
| Chassis ground | Eth_Sheild | 3 | 4 | Eth_Sheild | Chassis ground |
| | 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+ | |

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| JH2 | | | | | |
|---|---|---|---|---|---|
| | 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 | DCLK | Shift clock output 1 |
| | B | 41 | 42 | DCLK_2 | Shift clock output 2 |
| | C | 43 | 44 | LAT | Latch signal output |
| | D | 45 | 46 | CTRL | Afterglow control signal |
| | E | 47 | 48 | OE_RED | Display enable |
| 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 | |
| | NC | 111 | 112 | NC | |
| | NC | 113 | 114 | NC | |
| | NC | 115 | 116 | NC | |
| | GND | 117 | 118 | GND | |
| | GND | 119 | 120 | GND | |

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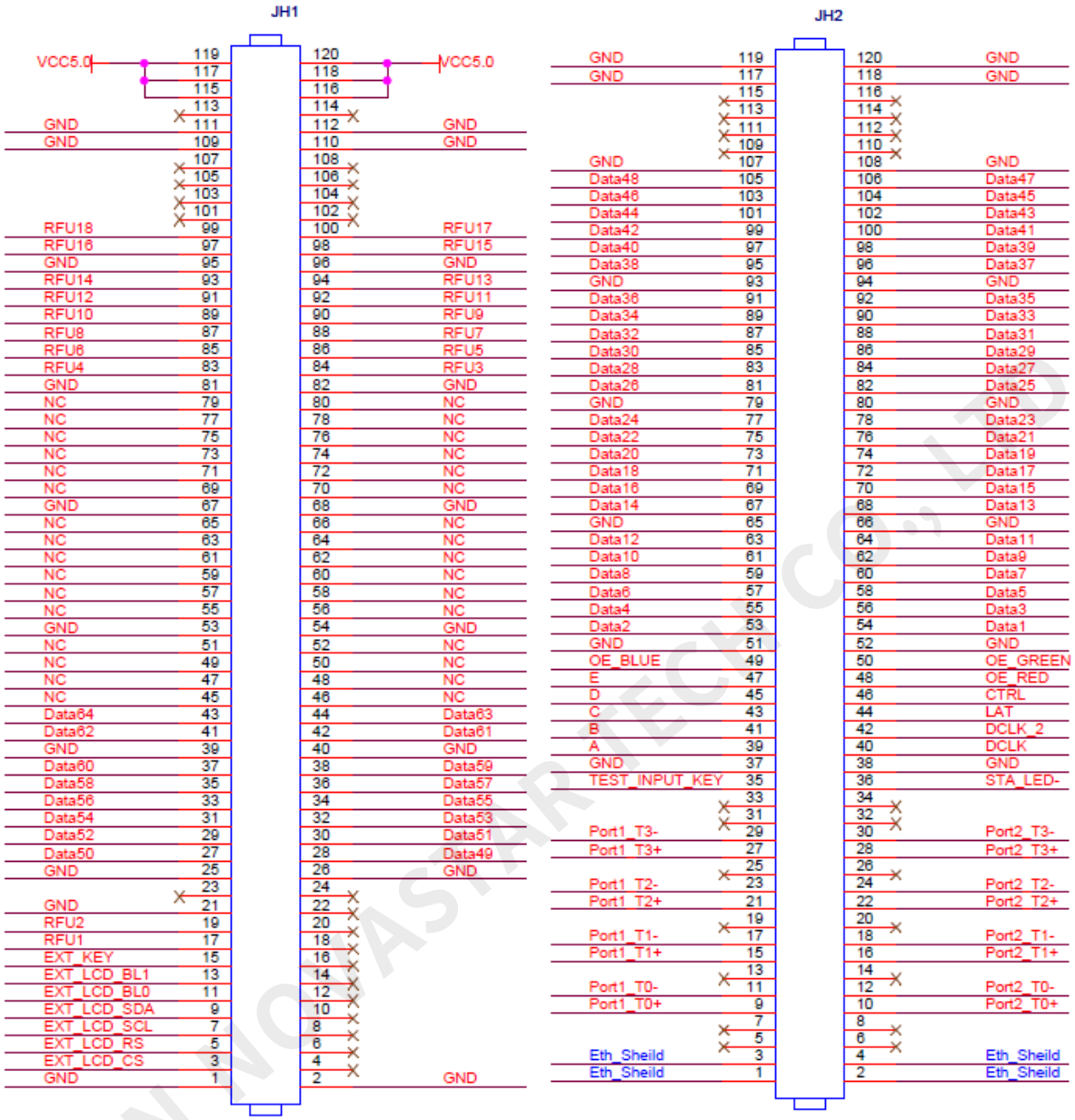
## 64 Groups of Serial Data




| JH1 | | | | | |
|---|---|---|---|---|---|
| | GND | 1 | 2 | GND | |
| LCD CS signal | EXT_LCD_CS | 3 | 4 | NC | |
| LCD RS signal | EXT_LCD_RS | 5 | 6 | NC | |
| LCD clock signal | EXT_LCD_SCL | 7 | 8 | NC | |
| LCD data signal | EXT_LCD_SDA | 9 | 10 | NC | |
| LCD backlight signal 1 | EXT_LCD_BL0 | 11 | 12 | NC | |
| LCD backlight signal 2 | EXT_LCD_BL1 | 13 | 14 | NC | |
| LCD control button | EXT_KEY | 15 | 16 | NC | |
| / | 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 | / |

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| JH1 | | | | | |
|---|---|---|---|---|---|
| / | 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 | |
| / | 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 | |
| | VCC | 115 | 116 | VCC | |
| | VCC | 117 | 118 | VCC | |
| | VCC | 119 | 120 | VCC | |

| JH2 | | | | | |
|---|---|---|---|---|---|
| Chassis ground | Eth_Sheild | 1 | 2 | Eth_Sheild | Chassis ground |
| Chassis ground | Eth_Sheild | 3 | 4 | Eth_Sheild | Chassis ground |
| | 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- | |

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| JH2 | | | | | |
|---|---|---|---|---|---|
| | 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 | DCLK | Shift clock output 1 |
| | B | 41 | 42 | DCLK_2 | Shift clock output 2 |
| | C | 43 | 44 | LAT | Latch signal output |
| | D | 45 | 46 | CTRL | Afterglow control signal |
| | E | 47 | 48 | OE_RED | Display enable |
| Display enable | OE_BLUE | 49 | 50 | OE_GREEN | |
| | 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 VCC 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.

## Reference Design for Extended Functions

| Pins for Extended Functions | | | |
|---|---|---|---|
| Pin | Recommended Smart Module Pin | Recommended Module Flash Pin | Description |
| RFU1 | Reserved | Reserved | A reserved pin for connection to MCU |

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| Pins for Extended Functions | | | |
|---|---|---|---|
| RFU2 | Reserved | Reserved | A reserved pin for connection to MCU |
| RFU3 | HUB_CODE0 | HUB_CODE0 | Flash control pin 1 |
| RFU4 | HUB_SPI_CLK | HUB_SPI_CLK | Clock signal of serial pin |
| RFU5 | HUB_CODE1 | HUB_CODE1 | Flash control pin 2 |
| RFU6 | HUB_SPI_CS | HUB_SPI_CS | CS signal of serial pin |
| RFU7 | HUB_CODE2 | HUB_CODE2 | Flash control pin 3 |
| RFU8 | / | HUB_SPI_MOSI | Module Flash data storage input |
| | HUB_UART_TX | / | Smart module TX signal |
| RFU9 | HUB_CODE3 | HUB_CODE3 | Flash control pin 4 |
| RFU10 | / | HUB_SPI_MISO | Module Flash data storage output |
| | HUB_UART_RX | / | Smart module RX signal |
| 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 supply detection signal 1 |
| RFU15 | MS_DATA | MS_DATA | Dual card backup connection signal |
| RFU16 | POWER_STA2 | POWER_STA2 | Dual power supply detection signal 2 |
| RFU17 | MS_ID | MS_ID | Dual card backup identifier signal |
| RFU18 | HUB_CODE4 | HUB_CODE4 | Flash control pin 5 |

**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 Loading Capacity | 512×512 pixels (PWM IC) | |
| Electrical Parameters | Input voltage | DC 3.3 V to 5.5 V |
| | Rated current | 0.5 A |
| | Rated power consumption | 2.5 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 × 9.1 mm |
| | Net weight | 22.3 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 | 378.0 mm × 190.0 mm × 120.0 mm |
| Certifications | RoHS, EMC Class B<br>Note: If the product does not have the relevant certifications required by the countries or regions where it is to be sold, please apply for the certifications yourself or contact NovaStar to apply for them. | |

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