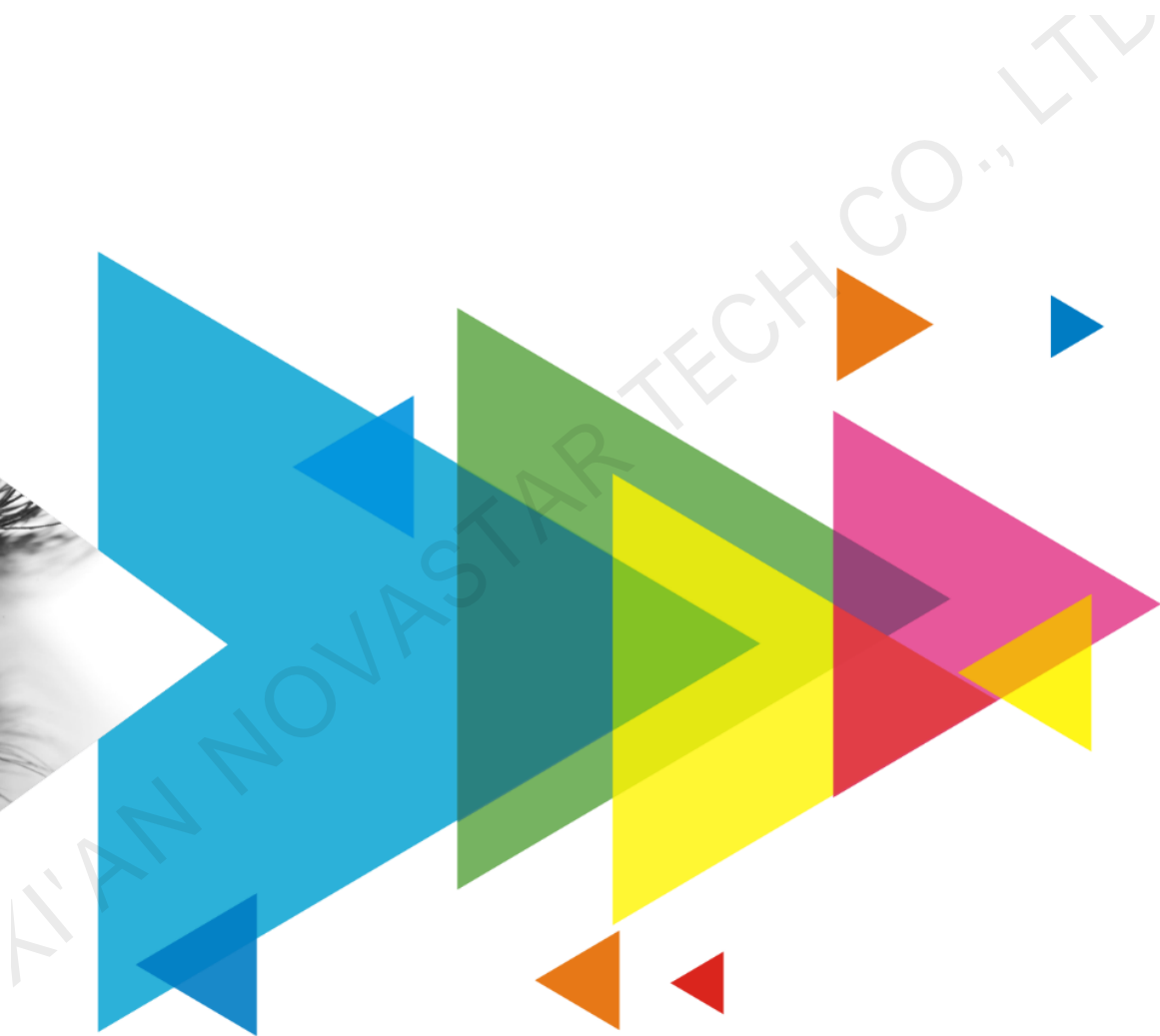


AT32

Receiving Card



Specifications

Change History

| Document Version | Release Date | Description |
|------------------|--------------|---|
| V1.3.0 | 2022-11-01 | Updated the appearance diagram. |
| V1.2.1 | 2022-08-31 | Updated the input voltage. |
| V1.2.0 | 2022-04-24 | Updated the top-view diagram. |
| V1.1.2 | 2022-03-26 | <ul style="list-style-type: none"> Added the certifications description. Added the dimensions diagram description. Updated some feature descriptions. Updated the pins section. |
| V1.1.1 | 2021-02-06 | Updated the packing information. |
| V1.1.0 | 2020-09-11 | <ul style="list-style-type: none"> Optimized the feature description. Optimized the dimensions diagram. Updated the maximum loading capacity. |
| V1.0.1 | 2020-04-09 | <ul style="list-style-type: none"> Updated the firmware version. Updated the indicator description. |
| V1.0.0 | 2020-01-02 | First release |

Introduction

The AT32 is a general small receiving card developed by Xi'an NovaStar Tech Co., Ltd. (hereinafter referred to as NovaStar). A single AT32 supports resolutions up to 512x384 @60Hz (NovaLCT V5.3.0 or later required). Supporting various functions such as pixel level brightness and chroma calibration, quick adjustment of dark or bright lines, 3D, individual gamma adjustment for RGB, and image rotation in 90° increments, the AT32 can significantly improve the display effect and user experience.

The AT32 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 AT32 has improved electromagnetic compatibility and is suitable for various on-site setups.

Certifications

RoHS, EMC Class B

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

- 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 brightness differences and chroma differences, and enabling high brightness consistency and chroma consistency.
- Quick adjustment of dark or bright lines
The dark or bright lines caused by splicing of modules and cabinets can be adjusted to

improve the visual experience. The adjustment is easy and takes effect immediately.

In NovaLCT V5.2.0 or later, the adjustment can be made without using or changing video source.

- 3D function
Working with the sending card that supports 3D function, the receiving card supports 3D image output.
- Individual gamma adjustment for RGB
Working with NovaLCT (V5.2.0 or later) and the sending card that supports this function, the

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.
- 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 of the cabinet can display the temperature, voltage, single run time and total run time of the receiving card.
- Bit error detection
The Ethernet port communication quality of the receiving card can be monitored and the number of erroneous packets can be recorded to help troubleshoot network communication problems.
NovaLCT V5.2.0 or later is required.
- 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 receiving card firmware program can be read back and saved to the local computer.
NovaLCT V5.2.0 or later is required.
- Configuration parameter readback
The receiving card configuration parameters 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).

receiving card supports individual adjustment of red gamma, green gamma and blue gamma, which can effectively control image non-uniformity under low grayscale and white balance offset, allowing for a more realistic image.

- Image rotation in 90° increments
The display image can be set to rotate in multiples of 90° (0°/90°/180°/270°).

Improvements to Reliability

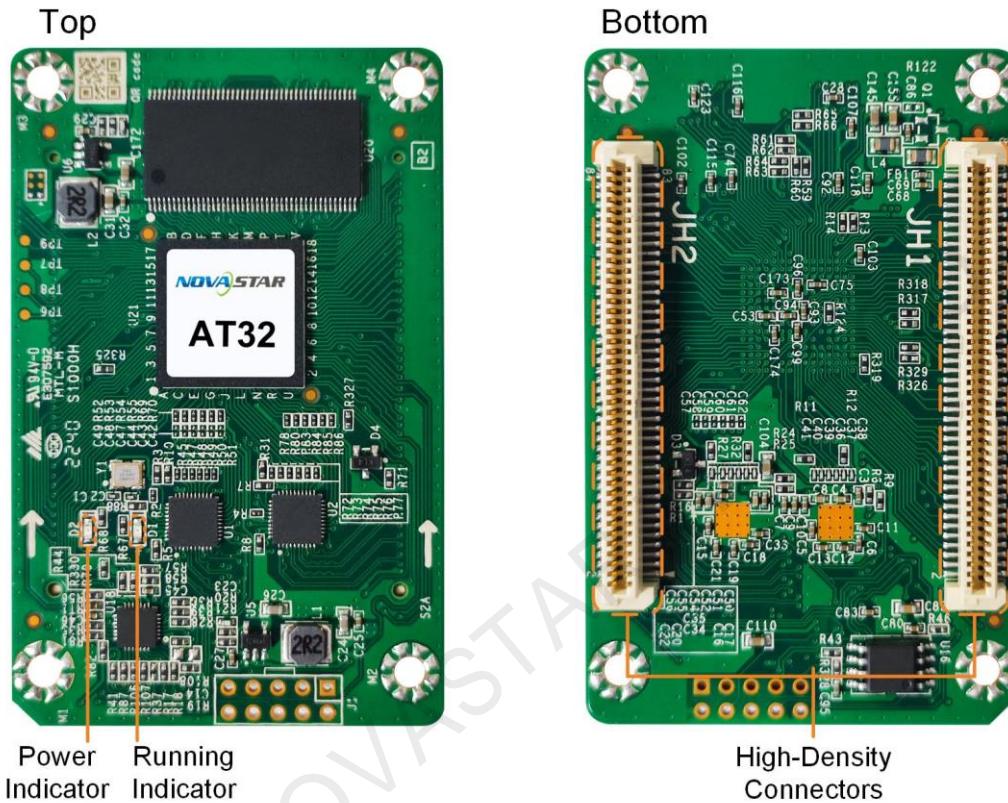
- Dual card backup and status monitoring
In an application with requirements for high reliability, two receiving cards can be mounted onto a single hub board for backup. If the main

receiving card fails, the backup card can serve immediately to ensure uninterrupted operation of the display.

- The working status of the main and backup receiving cards can be monitored in NovaLCT V5.2.0 or later.
- Loop backup
The receiving card and sending card form a loop via the main and backup line connections. If a fault occurs at a location of the lines, the screen can still display the image normally.

- 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.

Appearance



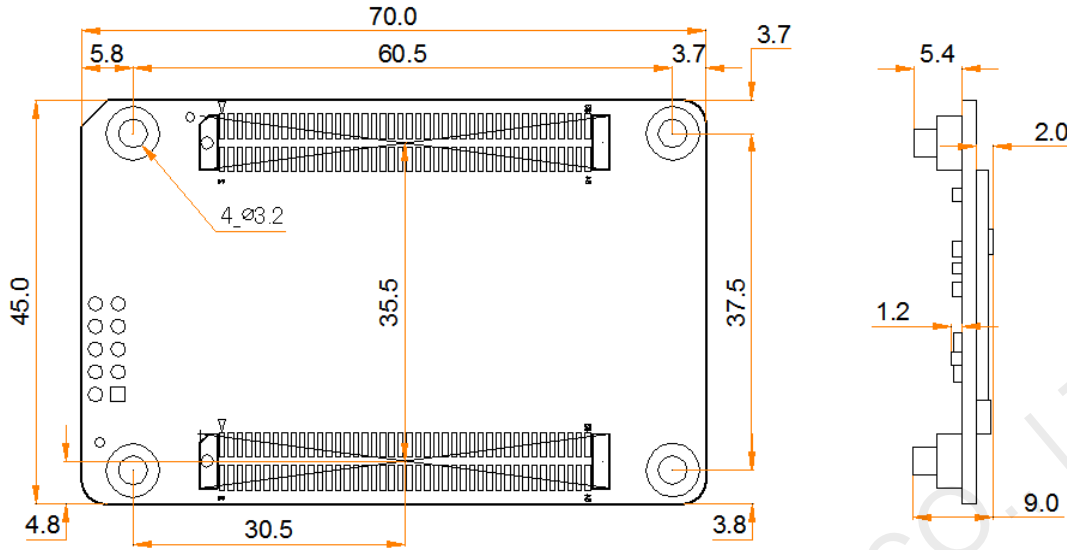
All product pictures shown in this document are for illustration purpose only. Actual product may vary.

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 supply 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.



Tolerance: ±0.3 Unit: mm

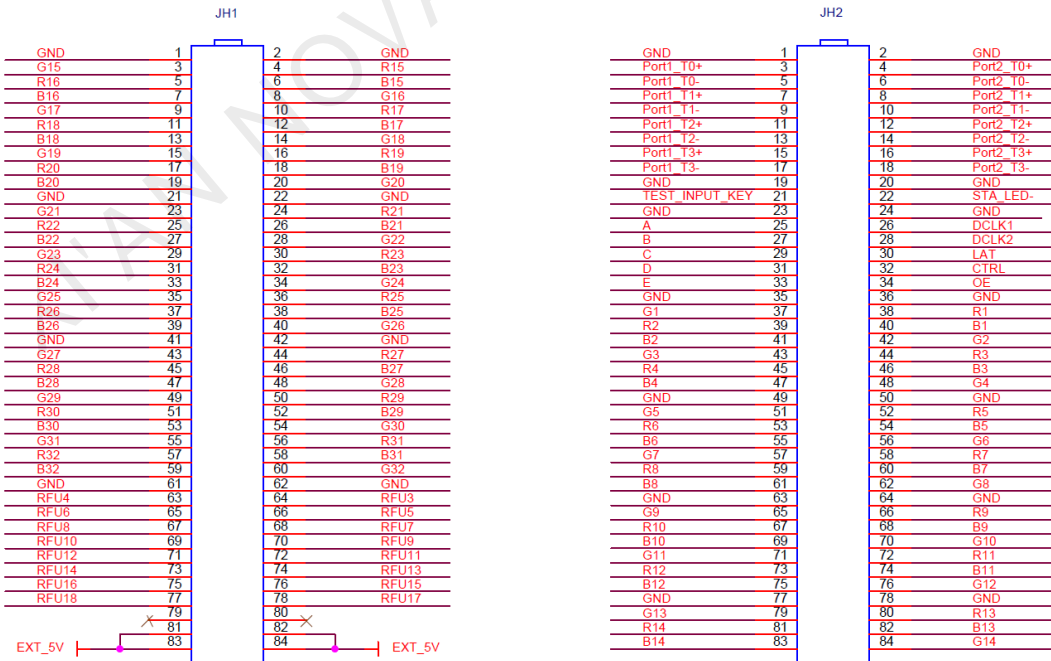
Note

The distance between outer surfaces of the AT32 and HUB boards after their high-density connectors fit together is 8.0 mm. An 8-mm copper pillar is recommended.

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

Pins

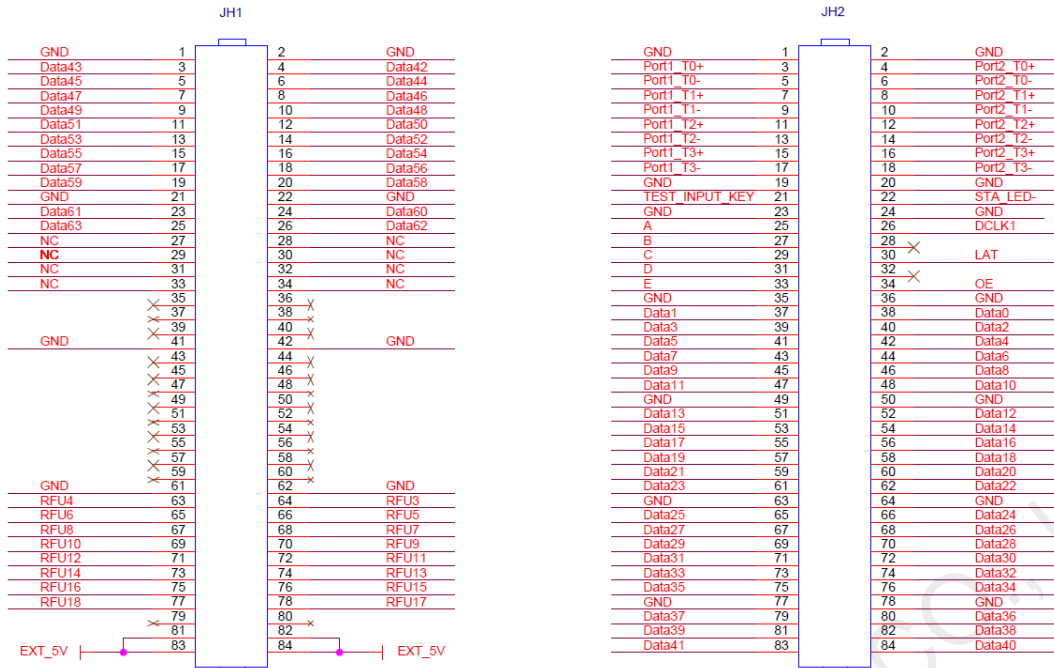
32 Groups of Parallel RGB Data



| JH1 | | | | | JH2 | | | | | | |
|--------|-----|---|---|-----|--------|------------------|-----------|---|---|-----------|------------------|
| Ground | GND | 1 | 2 | GND | Ground | Ground | GND | 1 | 2 | GND | Ground |
| / | G15 | 3 | 4 | R15 | / | Gigabit Ethernet | Port1_T0+ | 3 | 4 | Port2_T0+ | Gigabit Ethernet |
| / | R16 | 5 | 6 | B15 | / | Ethernet | Port1_T0- | 5 | 6 | Port2_T0- | Ethernet |

| JH1 | | | | | JH2 | | | | | | |
|----------|--------|----|-------|--------|----------|----------------------|--------------------|-----|--------|-----------|--------------------------|
| / | B16 | 7 | 8 | G16 | / | port | Port1_T1+ | 7 | 8 | Port2_T1+ | port |
| / | G17 | 9 | 10 | R17 | / | | Port1_T1- | 9 | 10 | Port2_T1- | |
| / | R18 | 11 | 12 | B17 | / | | Port1_T2+ | 11 | 12 | Port2_T2+ | |
| / | B18 | 13 | 14 | G18 | / | | Port1_T2- | 13 | 14 | Port2_T2- | |
| / | G19 | 15 | 16 | R19 | / | | Port1_T3+ | 15 | 16 | Port2_T3+ | |
| / | R20 | 17 | 18 | B19 | / | | Port1_T3- | 17 | 18 | Port2_T3- | |
| / | B20 | 19 | 20 | G20 | / | Ground | GND | 19 | 20 | GND | Ground |
| Ground | GND | 21 | 22 | GND | Ground | Test button | TEST_IN PUT_KEY | 21 | 22 | STA_LED- | Running indicator |
| / | G21 | 23 | 24 | R21 | / | Ground | GND | 23 | 24 | GND | Ground |
| / | R22 | 25 | 26 | B21 | / | Line decoding signal | A | 25 | 26 | DCLK1 | Shift clock |
| / | B22 | 27 | 28 | G22 | / | | B | 27 | 28 | DCLK2 | Shift clock |
| / | G23 | 29 | 30 | R23 | / | | C | 29 | 30 | LAT | Latch signal |
| / | R24 | 31 | 32 | B23 | / | | D | 31 | 32 | CTRL | Afterglow control signal |
| / | B24 | 33 | 34 | G24 | / | | E | 33 | 34 | OE | Display enable |
| / | G25 | 35 | 36 | R25 | / | Ground | GND | 35 | 36 | GND | Ground |
| / | R26 | 37 | 38 | B25 | / | / | G1 | 37 | 38 | R1 | / |
| / | B26 | 39 | 40 | G26 | / | / | R2 | 39 | 40 | B1 | / |
| Ground | GND | 41 | 42 | GND | Ground | / | B2 | 41 | 42 | G2 | / |
| / | G27 | 43 | 44 | R27 | / | / | G3 | 43 | 44 | R3 | / |
| / | R28 | 45 | 46 | B27 | / | / | R4 | 45 | 46 | B3 | / |
| / | B28 | 47 | 48 | G28 | / | / | B4 | 47 | 48 | G4 | / |
| / | G29 | 49 | 50 | R29 | / | Ground | GND | 49 | 50 | GND | Ground |
| / | R30 | 51 | 52 | B29 | / | / | G5 | 51 | 52 | R5 | / |
| / | B30 | 53 | 54 | G30 | / | / | R6 | 53 | 54 | B5 | / |
| / | G31 | 55 | 56 | R31 | / | / | B6 | 55 | 56 | G6 | / |
| / | R32 | 57 | 58 | B31 | / | / | G7 | 57 | 58 | R7 | / |
| / | B32 | 59 | 60 | G32 | / | / | R8 | 59 | 60 | B7 | / |
| Ground | GND | 61 | 62 | GND | Ground | / | B8 | 61 | 62 | G8 | / |
| Reserved | RFU4 | 63 | 64 | RFU3 | Reserved | Ground | GND | 63 | 64 | GND | Ground |
| | RFU6 | 65 | 66 | RFU5 | | / | G9 | 65 | 66 | R9 | / |
| | RFU8 | 67 | 68 | RFU7 | | / | R10 | 67 | 68 | B9 | / |
| | RFU10 | 69 | 70 | RFU9 | | / | B10 | 69 | 70 | G10 | / |
| | RFU12 | 71 | 72 | RFU11 | | / | G11 | 71 | 72 | R11 | / |
| | RFU14 | 73 | 74 | RFU13 | | / | R12 | 73 | 74 | B11 | / |
| | RFU16 | 75 | 76 | RFU15 | | / | B12 | 75 | 76 | G12 | / |
| RFU18 | 77 | 78 | RFU17 | Ground | GND | 77 | 78 | GND | Ground | | |
| / | NC | 79 | 80 | NC | / | / | G13 | 79 | 80 | R13 | / |
| 5V | EXT_5V | 81 | 82 | EXT_5V | 5V | / | R14 | 81 | 82 | B13 | / |
| | EXT_5V | 83 | 84 | EXT_5V | | / | B14 | 83 | 84 | G14 | / |

64 Groups of Serial Data



| JH1 | | | | | | JH2 | | | | | |
|----------|--------|----|----|--------|----------|-----------------------|-----------------|----|-----------|-----------|-----------------------|
| Ground | GND | 1 | 2 | GND | Ground | Ground | GND | 1 | 2 | GND | Ground |
| / | Data43 | 3 | 4 | Data42 | / | Gigabit Ethernet port | Port1_T0+ | 3 | 4 | Port2_T0+ | Gigabit Ethernet port |
| / | Data45 | 5 | 6 | Data44 | / | | Port1_T0- | 5 | 6 | Port2_T0- | |
| / | Data47 | 7 | 8 | Data46 | / | | Port1_T1+ | 7 | 8 | Port2_T1+ | |
| / | Data49 | 9 | 10 | Data48 | / | | Port1_T1- | 9 | 10 | Port2_T1- | |
| / | Data51 | 11 | 12 | Data50 | / | | Port1_T2+ | 11 | 12 | Port2_T2+ | |
| / | Data53 | 13 | 14 | Data52 | / | | Port1_T2- | 13 | 14 | Port2_T2- | |
| / | Data55 | 15 | 16 | Data54 | / | | Port1_T3+ | 15 | 16 | Port2_T3+ | |
| / | Data57 | 17 | 18 | Data56 | / | Port1_T3- | 17 | 18 | Port2_T3- | | |
| / | Data59 | 19 | 20 | Data58 | / | Ground | GND | 19 | 20 | GND | Ground |
| Ground | GND | 21 | 22 | GND | Ground | Test button | TEST_INP UT_KEY | 21 | 22 | STA_LED- | Running indicator |
| / | Data61 | 23 | 24 | Data60 | / | Ground | GND | 23 | 24 | GND | Ground |
| / | Data63 | 25 | 26 | Data62 | / | Line decoding signal | A | 25 | 26 | DCLK1 | Shift clock |
| / | NC | 27 | 28 | NC | / | | B | 27 | 28 | NC | / |
| / | NC | 29 | 30 | NC | / | | C | 29 | 30 | LAT | Latch signal |
| / | NC | 31 | 32 | NC | / | | D | 31 | 32 | NC | / |
| / | NC | 33 | 34 | NC | / | | E | 33 | 34 | OE | Display enable |
| / | NC | 35 | 36 | NC | / | Ground | GND | 35 | 36 | GND | Ground |
| / | NC | 37 | 38 | NC | / | / | Data1 | 37 | 38 | Data0 | / |
| / | NC | 39 | 40 | NC | / | / | Data3 | 39 | 40 | Data2 | / |
| Ground | GND | 41 | 42 | GND | Ground | / | Data5 | 41 | 42 | Data4 | / |
| / | NC | 43 | 44 | NC | / | / | Data7 | 43 | 44 | Data6 | / |
| / | NC | 45 | 46 | NC | / | / | Data9 | 45 | 46 | Data8 | / |
| / | NC | 47 | 48 | NC | / | / | Data11 | 47 | 48 | Data10 | / |
| / | NC | 49 | 50 | NC | / | Ground | GND | 49 | 50 | GND | Ground |
| / | NC | 51 | 52 | NC | / | / | Data13 | 51 | 52 | Data12 | / |
| / | NC | 53 | 54 | NC | / | / | Data15 | 53 | 54 | Data14 | / |
| / | NC | 55 | 56 | NC | / | / | Data17 | 55 | 56 | Data16 | / |
| / | NC | 57 | 58 | NC | / | / | Data19 | 57 | 58 | Data18 | / |
| / | NC | 59 | 60 | NC | / | / | Data21 | 59 | 60 | Data20 | / |
| Ground | GND | 61 | 62 | GND | Ground | / | Data23 | 61 | 62 | Data22 | / |
| Reserved | RFU4 | 63 | 64 | RFU3 | Reserved | Ground | GND | 63 | 64 | GND | Ground |
| | RFU6 | 65 | 66 | RFU5 | | / | Data25 | 65 | 66 | Data24 | / |
| | RFU8 | 67 | 68 | RFU7 | | / | Data27 | 67 | 68 | Data26 | / |
| | RFU10 | 69 | 70 | RFU9 | | / | Data29 | 69 | 70 | Data28 | / |
| | RFU12 | 71 | 72 | RFU11 | | / | Data31 | 71 | 72 | Data30 | / |

| JH1 | | | | | JH2 | | | | | | |
|-----|--------|----|----|--------|-----|--------|--------|----|----|--------|--------|
| | RFU14 | 73 | 74 | RFU13 | | / | Data33 | 73 | 74 | Data32 | / |
| | RFU16 | 75 | 76 | RFU15 | | / | Data35 | 75 | 76 | Data34 | / |
| | RFU18 | 77 | 78 | RFU17 | | Ground | GND | 77 | 78 | GND | Ground |
| / | NC | 79 | 80 | NC | / | / | Data37 | 79 | 80 | Data36 | / |
| 5V | EXT_5V | 81 | 82 | EXT_5V | 5V | / | Data39 | 81 | 82 | Data38 | / |
| | EXT_5V | 83 | 84 | EXT_5V | | / | Data41 | 83 | 84 | Data40 | / |

Reference Design for Extended Functions

| Description of 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 | | |
| 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 | 512x384@60Hz | |
| Electrical Specifications | Input voltage | DC 3.8 V to 5.5 V |
| | Rated current | 0.6 A |
| | Rated power consumption | 3.0 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 | 70.0 mm x 45.0 mm x 9.0 mm |
| | Net weight | 16.5 g Note: It is the weight of a single receiving card only. |
| Packing Information | Packing specifications | Each receiving card is packaged in a blister pack. Each packing box contains 80 receiving cards. |
| | Packing box dimensions | 378.0 mm x 190.0 mm x 120.0 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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