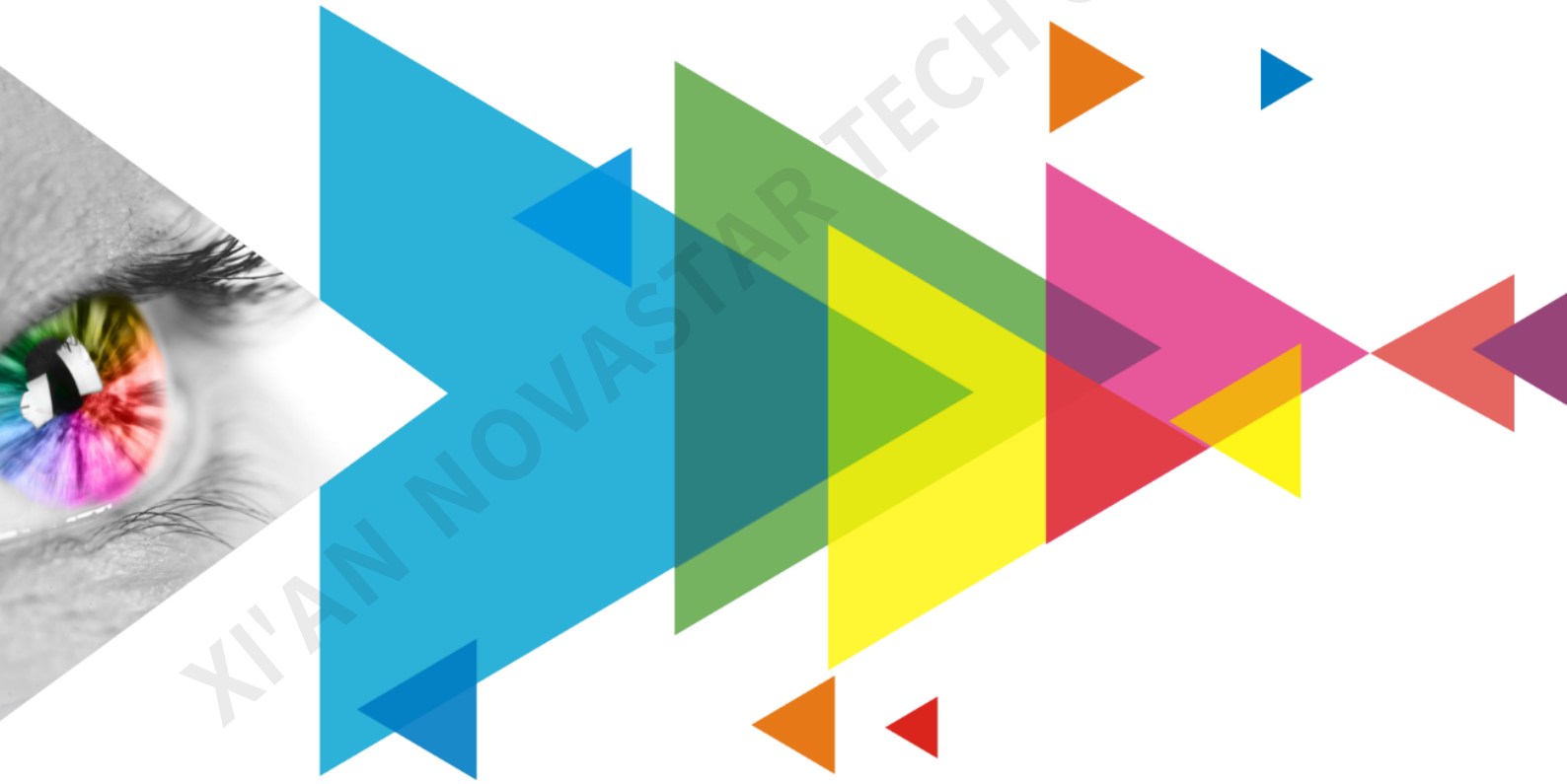
# XC190

## Receiving Card





Specifications

# Change History

| Document Version | Release Date | Description |
|---|---|---|
| V1.0.2 | 2022-07-13 | Updated the input voltage. |
| V1.0.1 | 2022-03-26 | • Added the dimensions diagram description.<br>• Updated the certifications description.<br>• Updated some feature descriptions.<br>• Updated the appearance diagram. |
| V1.0.0 | 2021-08-05 | First release |

# Introduction

The XC190 is a high-end small receiving card developed by NovaStar. A single XC190 supports resolutions up to 512×512@60Hz. Supporting various functions such as Image Booster, pixel level brightness and chroma calibration, quick adjustment of dark or bright lines, low latency, 3D, individual gamma adjustment for RGB, image rotation in 90° increments, image rotation at any angle, and HDR, the XC190 can significantly improve the display effect and user experience.

The XC190 comes with DDR2 connectors for communication, resulting in good compatibility. It supports up to 32 groups of parallel RGB data or 64 groups of serial data (expandable to 128 groups of serial data), and is suitable for various on-site setups.

# 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

- Image Booster
  The Image Booster has the following 3 functions that improve the display effect (the actual effect depends on the driver IC) from different dimensions.
  - Color Management: Allow users to freely switch the color gamut of the screen between different gamuts in real time to enable 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.

  NovaLCT V5.4.0 or later is required.

- 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 cabinets or modules can be adjusted to improve the visual experience. This function is easy to use and the adjustment takes effect immediately.
- 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).
- 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 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°).
- Image rotation at any angle
  Working with the MCTRL R5 LED display controller and SmartLCT, the receiving card supports image rotation at any angle.
- HDR
  HDR10 and HLG are supported.

  Work with the sending card that supports the HDR function to correctly parse the HDR video source and faithfully reproduce the original brightness range and color space, allowing for a more lifelike image.

## 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 connected to 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 firmware program of the receiving card can be read back and saved to the local computer.

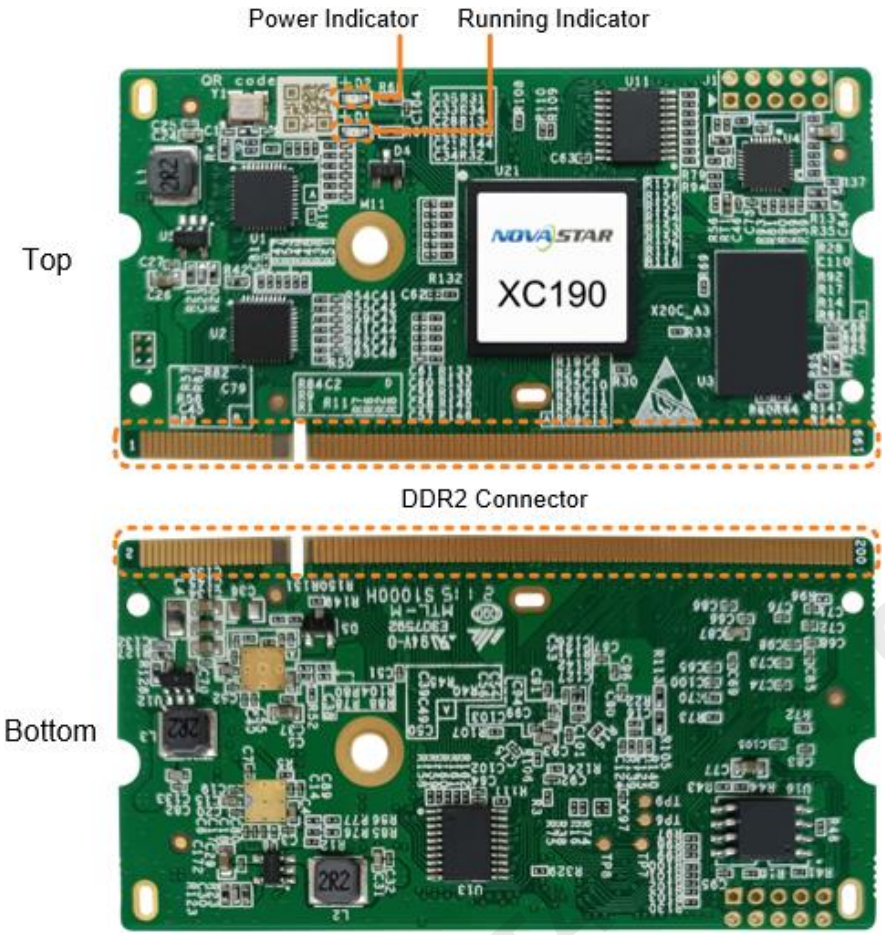
  NovaLCT V5.2.0 or later is required.
- Configuration parameter readback
  The configuration parameters of the receiving card can be read back and saved to the local computer.
- LVDS transmission (dedicated firmware required)
  Low-voltage differential signaling (LVDS) transmission is used to reduce the 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 application area of the receiving card at the factory to avoid the problem that the receiving card may get stuck abnormally during program update.
- 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 calibration coefficients in the application area. If necessary, users can restore the calibration coefficients in the factory area to the application area.

## Appearance



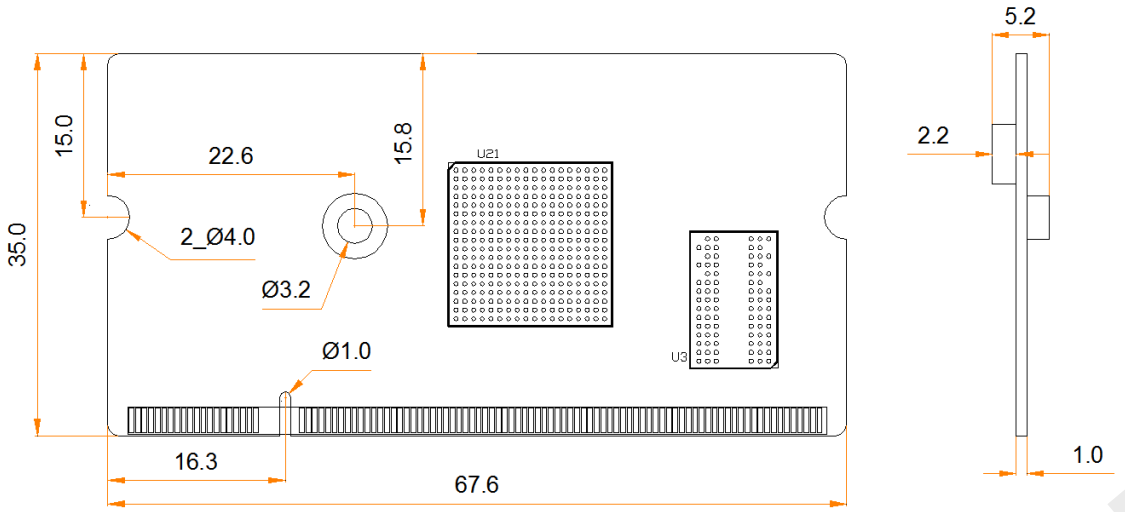

All product pictures shown in this document are for illustration purpose only. Actual product may vary.

## 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 1.0 mm, and the total thickness (board thickness + thickness of components on the top and bottom sides) is not greater than 6.0 mm. Ground connection (GND) is enabled for mounting holes.

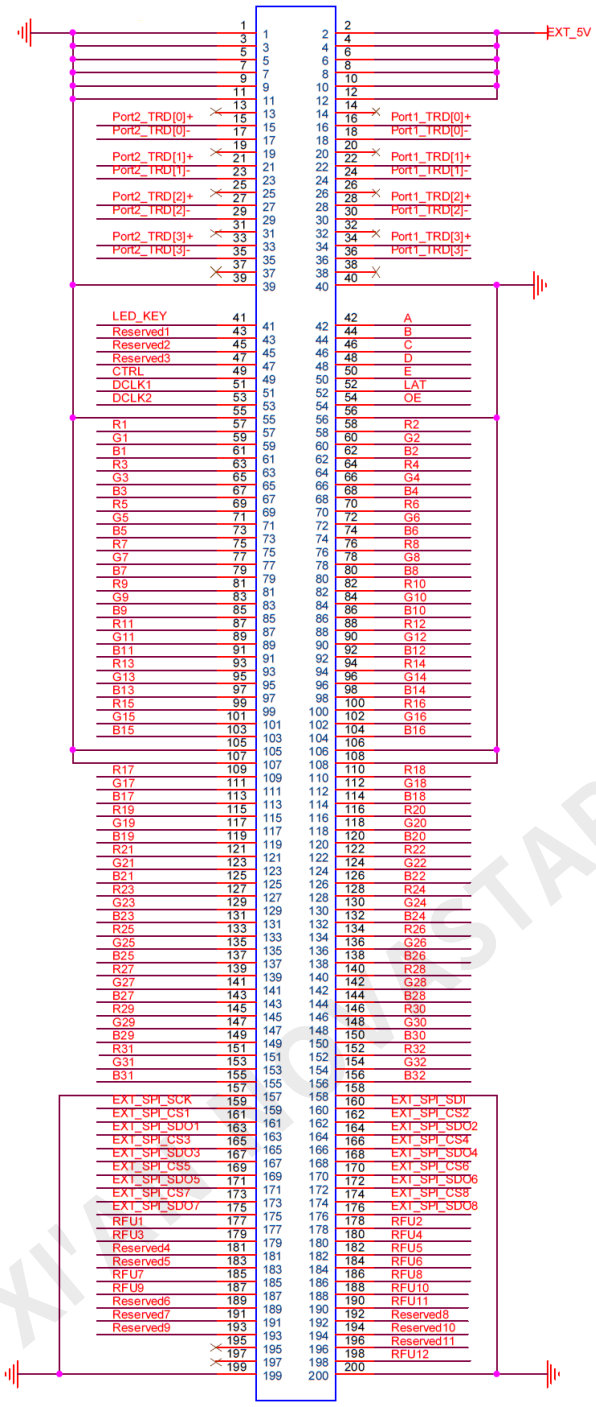



Tolerance: ±0.3 Unit: mm

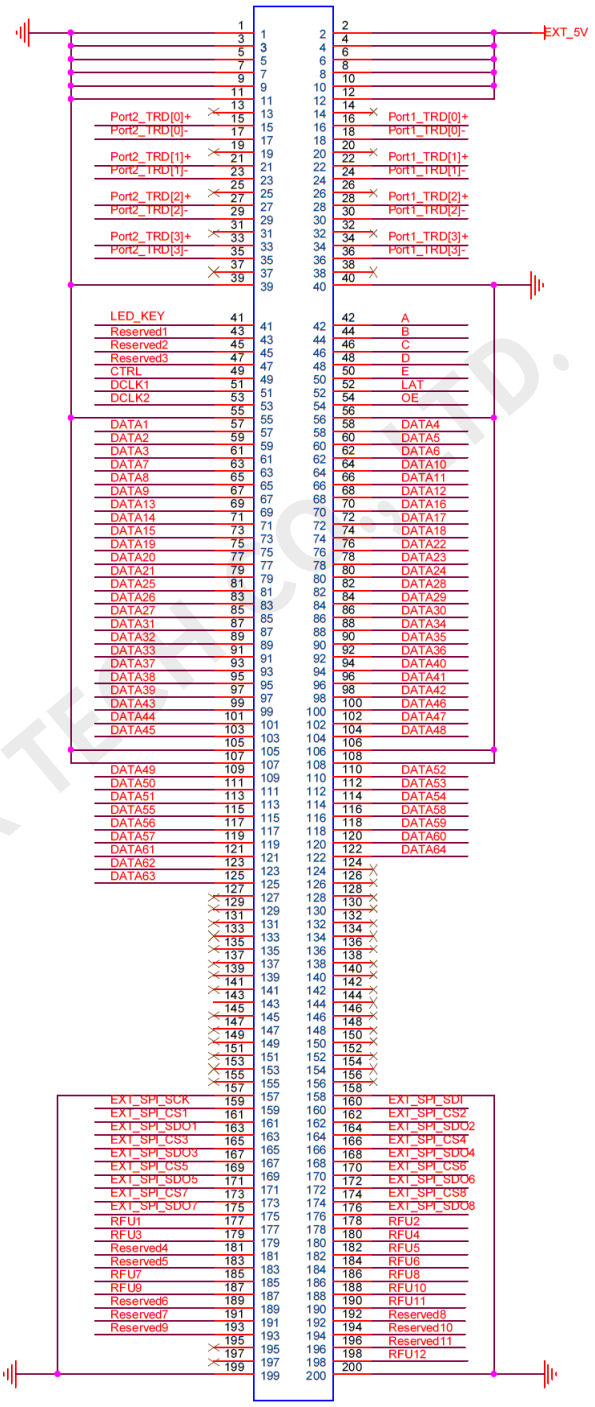
To make molds or trepan mounting holes, please contact NovaStar for a higher-precision structural drawing.

# Pins

32 Groups of Parallel RGB Data




64 Groups of Serial Data




## 32 Groups of Parallel RGB Data

| Pin Description | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| GND | 1 | 2 | VCC | | G15 | 101 | 102 | G16 |
| GND | 3 | 4 | VCC | | B15 | 103 | 104 | B16 |
| GND | 5 | 6 | VCC | | GND | 105 | 106 | GND |
| GND | 7 | 8 | VCC | | GND | 107 | 108 | GND |
| GND | 9 | 10 | VCC | | R17 | 109 | 110 | R18 |
| GND | 11 | 12 | VCC | | G17 | 111 | 112 | G18 |
| NC | 13 | 14 | NC | | B17 | 113 | 114 | B18 |
| Port2_TRD[0]+ | 15 | 16 | Port1_TRD[0]+ | | R19 | 115 | 116 | R20 |
| Port2_TRD[0]- | 17 | 18 | Port1_TRD[0]- | | G19 | 117 | 118 | G20 |

| Pin Description | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NC | 19 | 20 | NC | | B19 | 119 | 120 | B20 |
| Port2_TRD[1]+ | 21 | 22 | Port1_TRD[1]+ | | R21 | 121 | 122 | R22 |
| Port2_TRD[1]- | 23 | 24 | Port1_TRD[1]- | | G21 | 123 | 124 | G22 |
| NC | 25 | 26 | NC | | B21 | 125 | 126 | B22 |
| Port2_TRD[2]+ | 27 | 28 | Port1_TRD[2]+ | | R23 | 127 | 128 | R24 |
| Port2_TRD[2]- | 29 | 30 | Port1_TRD[2]- | | G23 | 129 | 130 | G24 |
| NC | 31 | 32 | NC | | B23 | 131 | 132 | B24 |
| Port2_TRD[3]+ | 33 | 34 | Port1_TRD[3]+ | | R25 | 133 | 134 | R26 |
| Port2_TRD[3]- | 35 | 36 | Port1_TRD[3]- | | G25 | 135 | 136 | G26 |
| NC | 37 | 38 | NC | | B25 | 137 | 138 | B26 |
| GND | 39 | 40 | GND | | R27 | 139 | 140 | R28 |
| LED_KEY | 41 | 42 | A | | G27 | 141 | 142 | G28 |
| Reserved1 | 43 | 44 | B | | B27 | 143 | 144 | B28 |
| Reserved2 | 45 | 46 | C | | R29 | 145 | 146 | R30 |
| Reserved3 | 47 | 48 | D | | G29 | 147 | 148 | G30 |
| CTRL | 49 | 50 | E | | B29 | 149 | 150 | B30 |
| DCLK1 | 51 | 52 | LAT | | R31 | 151 | 152 | R32 |
| DCLK2 | 53 | 54 | OE | | G31 | 153 | 154 | G32 |
| GND | 55 | 56 | GND | | B31 | 155 | 156 | B32 |
| R1 | 57 | 58 | R2 | | GND | 157 | 158 | GND |
| G1 | 59 | 60 | G2 | | EXT_SPI_SCK | 159 | 160 | EXT_SPI_SDI |
| B1 | 61 | 62 | B2 | | EXT_SPI_CS1 | 161 | 162 | EXT_SPI_CS2 |
| R3 | 63 | 64 | R4 | | EXT_SPI_SDO1 | 163 | 164 | EXT_SPI_SDO2 |
| G3 | 65 | 66 | G4 | | EXT_SPI_CS3 | 165 | 166 | EXT_SPI_CS4 |
| B3 | 67 | 68 | B4 | | EXT_SPI_SDO3 | 167 | 168 | EXT_SPI_SDO4 |
| R5 | 69 | 70 | R6 | | EXT_SPI_CS5 | 169 | 170 | EXT_SPI_CS6 |
| G5 | 71 | 72 | G6 | | EXT_SPI_SDO5 | 171 | 172 | EXT_SPI_SDO6 |
| B5 | 73 | 74 | B6 | | EXT_SPI_CS7 | 173 | 174 | EXT_SPI_CS8 |
| R7 | 75 | 76 | R8 | | EXT_SPI_SDO7 | 175 | 176 | EXT_SPI_SDO8 |
| G7 | 77 | 78 | G8 | | RFU1 | 177 | 178 | RFU2 |
| B7 | 79 | 80 | B8 | | RFU3 | 179 | 180 | RFU4 |
| R9 | 81 | 82 | R10 | | Reserved4 | 181 | 182 | RFU5 |
| G9 | 83 | 84 | G10 | | Reserved5 | 183 | 184 | RFU6 |
| B9 | 85 | 86 | B10 | | RFU7 | 185 | 186 | RFU8 |
| R11 | 87 | 88 | R12 | | RFU9 | 187 | 188 | RFU10 |
| G11 | 89 | 90 | G12 | | Reserved6 | 189 | 190 | RFU11 |
| B11 | 91 | 92 | B12 | | Reserved7 | 191 | 192 | Reserved8 |
| R13 | 93 | 94 | R14 | | Reserved9 | 193 | 194 | Reserved10 |
| G13 | 95 | 96 | G14 | | NC | 195 | 196 | Reserved11 |
| B13 | 97 | 98 | B14 | | NC | 197 | 198 | RFU12 |
| R15 | 99 | 100 | R16 | | GND | 199 | 200 | GND |

## 64 Groups of Serial Data

| Pin Description | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| GND | 1 | 2 | VCC | | DATA44 | 101 | 102 | DATA47 |
| GND | 3 | 4 | VCC | | DATA45 | 103 | 104 | DATA48 |
| GND | 5 | 6 | VCC | | GND | 105 | 106 | GND |
| GND | 7 | 8 | VCC | | GND | 107 | 108 | GND |
| GND | 9 | 10 | VCC | | DATA49 | 109 | 110 | DATA52 |
| GND | 11 | 12 | VCC | | DATA50 | 111 | 112 | DATA53 |
| NC | 13 | 14 | NC | | DATA51 | 113 | 114 | DATA54 |
| Port2_TRD[0]+ | 15 | 16 | Port1_TRD[0]+ | | DATA55 | 115 | 116 | DATA58 |
| Port2_TRD[0]- | 17 | 18 | Port1_TRD[0]- | | DATA56 | 117 | 118 | DATA59 |
| NC | 19 | 20 | NC | | DATA57 | 119 | 120 | DATA60 |
| Port2_TRD[1]+ | 21 | 22 | Port1_TRD[1]+ | | DATA61 | 121 | 122 | DATA64 |
| Port2_TRD[1]- | 23 | 24 | Port1_TRD[1]- | | DATA62 | 123 | 124 | NC |
| NC | 25 | 26 | NC | | DATA63 | 125 | 126 | NC |
| Port2_TRD[2]+ | 27 | 28 | Port1_TRD[2]+ | | NC | 127 | 128 | NC |
| Port2_TRD[2]- | 29 | 30 | Port1_TRD[2]- | | NC | 129 | 130 | NC |
| NC | 31 | 32 | NC | | NC | 131 | 132 | NC |
| Port2_TRD[3]+ | 33 | 34 | Port1_TRD[3]+ | | NC | 133 | 134 | NC |
| Port2_TRD[3]- | 35 | 36 | Port1_TRD[3]- | | NC | 135 | 136 | NC |
| NC | 37 | 38 | NC | | NC | 137 | 138 | NC |
| GND | 39 | 40 | GND | | NC | 139 | 140 | NC |
| LED_KEY | 41 | 42 | A | | NC | 141 | 142 | NC |

| Pin Description | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reserved1 | 43 | 44 | B | | NC | 143 | 144 | NC |
| Reserved2 | 45 | 46 | C | | NC | 145 | 146 | NC |
| Reserved3 | 47 | 48 | D | | NC | 147 | 148 | NC |
| CTRL | 49 | 50 | E | | NC | 149 | 150 | NC |
| DCLK1 | 51 | 52 | LAT | | NC | 151 | 152 | NC |
| DCLK2 | 53 | 54 | OE | | NC | 153 | 154 | NC |
| GND | 55 | 56 | GND | | NC | 155 | 156 | NC |
| DATA1 | 57 | 58 | DATA4 | | GND | 157 | 158 | GND |
| DATA2 | 59 | 60 | DATA5 | | EXT_SPI_SCK | 159 | 160 | EXT_SPI_SDI |
| DATA3 | 61 | 62 | DATA6 | | EXT_SPI_CS1 | 161 | 162 | EXT_SPI_CS2 |
| DATA7 | 63 | 64 | DATA10 | | EXT_SPI_SDO1 | 163 | 164 | EXT_SPI_SDO2 |
| DATA8 | 65 | 66 | DATA11 | | EXT_SPI_CS3 | 165 | 166 | EXT_SPI_CS4 |
| DATA9 | 67 | 68 | DATA12 | | EXT_SPI_SDO3 | 167 | 168 | EXT_SPI_SDO4 |
| DATA13 | 69 | 70 | DATA16 | | EXT_SPI_CS5 | 169 | 170 | EXT_SPI_CS6 |
| DATA14 | 71 | 72 | DATA17 | | EXT_SPI_SDO5 | 171 | 172 | EXT_SPI_SDO6 |
| DATA15 | 73 | 74 | DATA18 | | EXT_SPI_CS7 | 173 | 174 | EXT_SPI_CS8 |
| DATA19 | 75 | 76 | DATA22 | | EXT_SPI_SDO7 | 175 | 176 | EXT_SPI_SDO8 |
| DATA20 | 77 | 78 | DATA23 | | RFU1 | 177 | 178 | RFU2 |
| DATA21 | 79 | 80 | DATA24 | | RFU3 | 179 | 180 | RFU4 |
| DATA25 | 81 | 82 | DATA28 | | Reserved4 | 181 | 182 | RFU5 |
| DATA26 | 83 | 84 | DATA29 | | Reserved5 | 183 | 184 | RFU6 |
| DATA27 | 85 | 86 | DATA30 | | RFU7 | 185 | 186 | RFU8 |
| DATA31 | 87 | 88 | DATA34 | | RFU9 | 187 | 188 | RFU10 |
| DATA32 | 89 | 90 | DATA35 | | Reserved6 | 189 | 190 | RFU11 |
| DATA33 | 91 | 92 | DATA36 | | Reserved7 | 191 | 192 | Reserved8 |
| DATA37 | 93 | 94 | DATA40 | | Reserved9 | 193 | 194 | Reserved10 |
| DATA38 | 95 | 96 | DATA41 | | NC | 195 | 196 | Reserved11 |
| DATA39 | 97 | 98 | DATA42 | | NC | 197 | 198 | RFU12 |
| DATA43 | 99 | 100 | DATA46 | | GND | 199 | 200 | GND |

## Reference Design for Extended Functions

| Name | Predefinition | Description |
|---|---|---|
| RFU1 | POWER_STA1 | Dual power supply detection signal 1 |
| RFU2 | EXT_LCD_BL0 | LCD backlight signal 1 |
| RFU3 | POWER_STA2 | Dual power supply detection signal 2 |
| RFU4 | EXT_LCD_CD/RS | LCD RS signal |
| RFU5 | EXT_LCD_SDA/DB1 | LCD data signal |
| RFU6 | EXT_LCD_SCL/DB0 | LCD clock signal |
| RFU7 | EXT_MCU_ADC | Reserved external voltage detection pin |
| RFU8 | EXT_LCD_CS/RW | LCD CS signal |
| RFU9 | EXT_MCU_TXD | Reserved serial port output signal |
| RFU10 | MS_ID | Dual card backup identifier signal |
| RFU11 | MS_DATA | Dual card backup connection signal |
| RFU12 | EXT_LCD_BL1 | LCD backlight signal 2 |

# Specifications

| | | |
|---|---|---|
| Maximum Resolution | 512×512@60Hz | |
| Electrical Parameters | 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 | Temperature | –25°C to +125°C |

| | | |
|---|---|---|
| Environment | Humidity | 0% RH to 95% RH, non-condensing |
| Physical Specifications | Dimensions | 67.6 mm × 35.0 mm × 5.2 mm |
| | Net weight | 7.2 g<br>Note: It is the weight of a single receiving card only. |
| | Gross weight | 840.0 g<br>Note: It is the total weight of the products, printed materials and packing materials packed according to the packing specifications. |
| 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 |

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

**Trademark**

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**Statement**

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