# 1.78" 320*385 IPS GC9403 262K 8 Bit B2B Connector 24 Pin

ALP ELECTRONIX

- GC9403 is driven with 18 bit color depth.
- On-chip full display RAM: 345,600 bytes.
- Power saving mode:
  - Sleep mode
- Display Colors (Color Mode)
  - Full Color: 262K-color, 65K-color, Idle Mode Off.
  - Color Reduce: 8-color, Idle Mode On.
- On Chip Functions
  - Dot/Column/Z inversion
  - Separate RGB Gamma correction
  - CABC (Content Adaptive Brightness Control)
- Programmable Pixel Color Format (Color Depth) for Various Display Data input Format
  - 16-bit/pixel: RGB=(565)
  - 18-bit/pixel: RGB=(666)
- 8 Bits parallel interface.
- Normally black.
- IPS, all view direction.
- Power Supply
  - VDD: 2.5V - 3.6V.
- Brightness: 400 cd/$m^2$.
- Low Profile Board-to-Board Connector.

# 1 General Specifications

| No. | Item | Contents | Unit | Remark |
|---|---|---|---|---|
| 1 | **LCD Size** | 1.78 | inch | |
| 2 | **Panel Type** | IPS | - | |
| 3 | **Resolution** | 320RGB x 385 | Pixel | |
| 4 | **Display Mode** | Normally Black | - | |
| 5 | **Number of Colors** | 262k | - | |
| 6 | **Viewing Direction** | ALL | - | Note 1 |
| 7 | **Contrast Ratio** | 1000 | - | Typ. |
| 8 | **Luminance** | 400 | cd/m2 | Typ. |
| 9 | **Module Size** | 30.95 x 40.3 x 1.56 | mm | Note 1 |
| 10 | **Panel Active Area** | 28.85(H) x 34.71(V) | mm | Note 1 |
| 11 | **Pixel Pitch** | 0.09015 (H) x 0.09015 (V) | mm | |
| 12 | **Pixel Arrangement** | RGB Vertical Stripe | - | |
| 13 | **Driver IC** | GC9403 | - | |
| 14 | **Light Source** | 3 white LEDs | - | |
| 14 | **Interface** | MCU-8BIT | - | |
| 15 | **Operating Temperature** | -20~+70 | °C | |
| 16 | **Storage Temperature** | -30~+80 | °C | |
| 19 | **Weight** | TBD | g | |

Note 1: Please refer to the mechanical drawing;

# 2 Electrical Characteristics

## 2.1 Absolute Maximum Ratings

| Parameter | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|
| **Power Supply Voltage** | $V_{DD}$ | -0.3 | 4.6 | V |
| **Operation Temperature** | $T_{OP}$ | -20 | 70 | °C |
| **Storage Temperature** | $T_{ST}$ | -30 | 80 | °C |

## 2.2 Operating Conditions

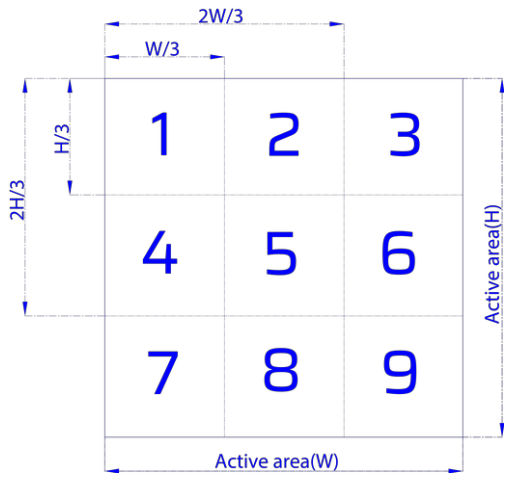
| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| **Supply Voltage** | $V_{DD}$ | 2.5 | 2.8 | 3.6 | V |
| **Input Voltage** | $V_{IH}$ | 0.8*$V_{DD}$ | - | $V_{DD}$ | V |
| | $V_{IL}$ | 0 | - | 0.2*$V_{DD}$ | V |
| **Output Voltage** | $V_{OH}$ | 0.8*$V_{DD}$ | - | $V_{DD}$ | V |
| | $V_{OL}$ | 0 | - | 0.2*$V_{DD}$ | V |

## 2.3 Backlight Unit

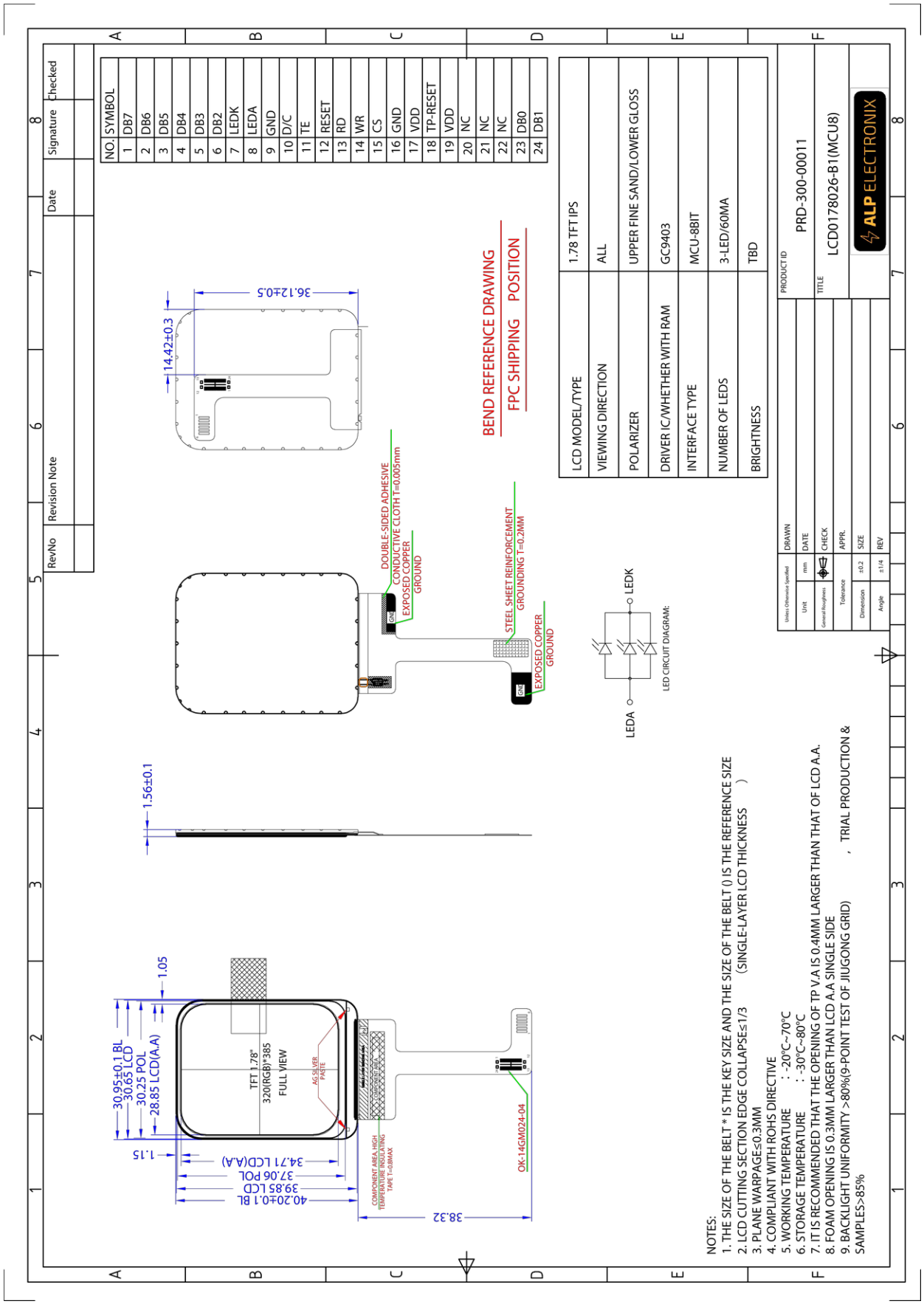
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Notes |
|---|---|---|---|---|---|---|
| **Voltage for LED backlight** | $V_{LED}$ | 2.8 | 3.0 | 3.2 | V | |
| **Current for LED backlight** | $I_{LED}$ | - | 60 | - | mA | 3 LED |
| **Power Consumption** | $P_{bl}$ | - | 180 | - | mW | 1 |

Notes:

1. Where $I_{LED}$ = 60mA, $V_{LED}$ = 3.0V, $P_{CONSUMPTION}$ = $I_{LED}$ * $V_{LED.}$
2. Uniform measure condition:
   a) Measure 9 point, measure location is shown on the right side.
   b) Uniform = (Min. brightness / Max brightness) * 100%
   c) Best contrast.
3. The environmental conducted under ambient air flow ,at Ta=25±2°C,60%RH±5%



# 3 Mechanical Drawing



# 4 Pin Definition

FPC Connector is used for the module electronics interface.

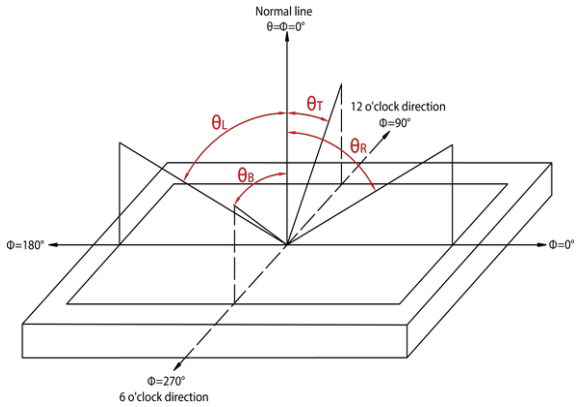
| Pin No. | Symbol | Description |
|---|---|---|
| 1 | **DB7** | Data bus 7. |
| 2 | **DB6** | Data bus 6. |
| 3 | **DB5** | Data bus 5. |
| 4 | **DB4** | Data bus 4. |
| 5 | **DB3** | Data bus 3. |
| 6 | **DB2** | Data bus 2. |
| 7 | **LEDK** | Backlight LED cathode. |
| 8 | **LEDA** | Backlight LED anode. |
| 9 | **GND** | Ground pin. |
| 10 | **D/C** | Data/command selection |
| 11 | **TE** | Tearing effect output pin to synchronize MCU to frame writing. |
| 12 | **$\overline{\text{RESET}}$** | Reset signal. Active low. |
| 13 | **RD** | Read data. |
| 14 | **WR** | Write data. |
| 15 | **$\overline{\text{CS}}$** | Chip select pin. Active low. |
| 16 | **GND** | Ground pin. |
| 17 | **VDD** | Power supply pin. VDD = 2.5~3.6V |
| 18 | **NC** | No connection. |
| 19 | **VDD** | Power supply pin. VDD = 2.5~3.2V |
| 20 | **NC** | No connection. |
| 21 | **NC** | No connection. |
| 22 | **NC** | No connection. |
| 23 | **DB0** | Data bus 0. |
| 24 | **DB1** | Data bus 1. |

# 5 Optical Characteristics

| Item | Symbol | Measuring Conditions | | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| **Viewing Angle**[1] | **θ** | Φ = 0º | 25ºC | 80 | 85 | - | Degree | CR≥10 Note 1 |
| | | Φ = 180º | 25ºC | 80 | 85 | - | | |
| | **θ** | Φ = 90º | 25ºC | 80 | 85 | - | | |
| | | Φ = 270º | 25ºC | 80 | 85 | - | | |
| **Luminance** | **L** | -- | - | - | TBD | | | |
| **Contrast Ratio** | **CR** | - | 25ºC | 800 | 1000 | - | - | Note 2 |
| **Response Time** | **$T_R$+$T_F$** | θ = 0º Φ = 0º | 25ºC | - | 30 | 45 | mS | Note 3 |
| **Color of CIE Coordinate** | **White** | X | 25ºC | - | 0.322 | - | - | BM-7A |
| | | Y | 25ºC | | 0.344 | | | |
| | **Red** | X | 25ºC | | 0.618 | | | |
| | | Y | 25ºC | | 0.328 | | | |
| | **Green** | X | 25ºC | | 0.335 | | | |
| | | Y | 25ºC | | 0.542 | | | |
| | **Blue** | X | 25ºC | | 0.136 | | | |
| | | Y | 25ºC | | 0.145 | | | |
| **Uniformity** | **$U_L$** | - | - | 2.7 | 3.0 | - | % | |
| **Flicker** | - | | | ≤20% | | | | |

Notes:

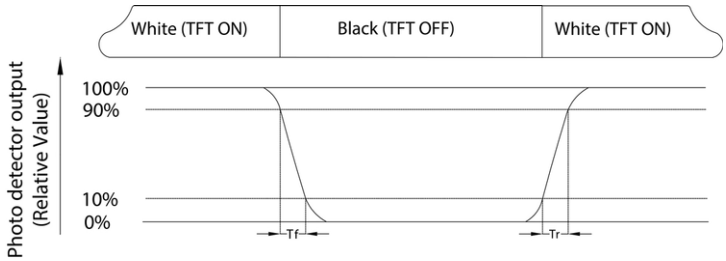
1. Definition of Viewing Angle:




Viewing angle is the angle at which the contrast ratio is greater than 10.The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.

2. Definition of Contrast Ratio (CR): Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white.

3. Definition of Response Time: Sum of $T_R$ and $T_F$ Response time is the time required for the display to transition from white to black (Rising time, Tr) and from black to white (Falling time, Tf) for additional information.



# 6 Reliability

## 6.1 Contents of Reliability Tests

| No. | Item | Conditions | Test result determinant gist |
|---|---|---|---|
| 1 | **High Temperature Operation** | 70±3°C,24 hrs | Inspection after 2~4hours storage at room temperature, the sample shall be free from defects:<br>• Air bubble in the LCD;<br>• Non-display;<br>• Glass crack;<br>• The electrical characteristics requirements shall be satisfied. |
| 2 | **Low Temperature Operation** | -20±3°C,24 hrs | |
| 3 | **High Temperature Storage** | 80±3°C,24 hrs | |
| 4 | **Low Temperature Storage** | -30±3°C,24 hrs | |
| 5 | **High Temperature /Humidity Operation** | 50°C±3°C,90%±3%RH,24 hrs; | |
| 6 | **Temperature Cycling** | -30°C→80°C<br>30min 30min<br>24 cycle. | |
| 7 | **Vibration Test** | Total fixed amplitude:1.5mm.<br>Vibration frequency:10~55Hz<br>X, Y, Z direction for total 1 hrs | |
| 8 | **ESD Test** | ±8KV, Air Mode,150pF/330Ω; | |

Remark:

- The test samples should be applied to only one test item.
- Sample size for each test item is 2pcs.
- Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic,
- Optical Characteristic.

# 7 Revision History

| Revision | Details |
|---|---|
| 1.0 | Initial Release – 01.01.2023 |

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