

PRODUCTION SPECIFICATION OF LCD MODULE MODULE NO. BI040HD01-CT

| | | | |
|------------------------------|--|--------------|--|
| Customer Name: | | | |
| Customer Part Number: | | | |
| Approved By: | | Date: | |

| | | |
|--------------------|-------------------|--------------------|
| Prepared By | Checked By | Approved By |
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Revision History

| Rev | Issued Date | Description | Page | Editor |
|-----|---------------|---|------|--------|
| 1.0 | Mar 22,2018 | First release | All | |
| 1.1 | April 27,2018 | Update pin description and Block diagram | 5,8 | |
| 1.2 | June 22,2018 | Update the Number of color | 4 | |
| 1.3 | July 20,2018 | Update pin description | 5 | |
| 1.4 | Aug.04,2018 | Update drawing and Electrical Characteristics | | |
| 1.5 | Aug.24,2018 | Update P/N of driver IC | All | |

1 General Specifications

| Feature | | Specifications |
|----------------------------|------------------------------------|------------------------|
| Display Spec. | LCD type | 4.0 inch |
| | Resolution (H*V) | 720(RGB)×720 |
| | Technology Type | a-Si TFT |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Display Mode | Normally Black |
| | Viewing Direction | ALL |
| | Gray Scale Inversion Direction | - |
| Mechanical Characteristics | OutlineDimensions (W x H x T) (mm) | 84.0*84.0*2.6 |
| | Active Area(mm) | 71.93*71.93 |
| | CTP View Area(mm) | 72.53*72.53 |
| | With /Without Touch screen | With CTP |
| | Connector Type (for LCD) | 0.5mm pitch 40pin ZIF |
| | Backlight Type | LED |
| | Weight (g) | TBD |
| Electrical Characteristics | Display Interface | RGB 18bits |
| | Touch Interface | I2C |
| | Number of color | 262K |
| | Display Driver IC | / |
| | Touch Driver IC | FT6336U |

2 Pin Assignment

| | | |
|-------|----------|--|
| 1 | LED A | LED ANODE |
| 2 | LED K1 | LED CATHODE |
| 3 | LED K2 | LED CATHODE |
| 4 | GND | Ground |
| 5 | VCI | Power supply (+3.3V) |
| 6 | RESET | Reset Signal ,Active Low |
| 7 | IM1 | Pull high (connect to VCI) |
| 8 | IM0 | Pull high (connect to VCI) |
| 9 | SDA | Not connection |
| 10 | SCK | Not connection |
| 11 | CS | Not connection |
| 12 | PCLK | RGB dot clock signal |
| 13 | DE | RGB data enable signal |
| 14 | VSYNC | RGB frame synchronizing signal |
| 15 | HSYNC | RGB line synchronizing signal |
| 16~33 | DB0~DB17 | RGB data signal (DB0: Blue LSB; DB5:Blue MSB; DB6: GREEN LSB; DB11: GREEN MSB; DB12: RED LSB; DB17: RED MSB) |
| 34 | GND | Ground |
| 35 | TP_INT | Touch Interrupt |
| 36 | TP_SDA | Touch IIC Data signal |
| 37 | TP_SCL | Touch IIC Clock signal |
| 38 | TP_RESET | Touch Reset Signal |
| 39 | TP_VCI | Touch Power supply (3.3V) |
| 40 | GND | Ground |

3 Absolute Maximum Ratings

GND=0V, Ta= 25°C

| Item | Symbol | Value | Unit |
|-----------------------|--------|-----------|------|
| Operating temperature | Topr | -20 to 70 | °C |
| Storage temperature | Tstg | -30 to 80 | °C |

Note: Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken.

They do not assure operations.

Note2: Background color changes slightly depending on ambient temperature. This Phenomenon is reversible.

Ta ≤ 70°C: 75%RH max

Ta > 70°C: absolute humidity must be lower than the humidity of 75%RH at 70°C

Note3: Ta at -30°C will be <48hrs, at 80 °C will be <120hrs

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

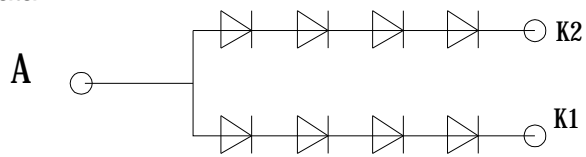
| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---------------------|--------|-----|-----|-----|------|--------|
| Analog power supply | VCI | 2.8 | 3.3 | 3.6 | V | |
| Power consumption | Ivci | 60 | 70 | 75 | mA | |

4.2 Driving Backlight

Ta=25°C

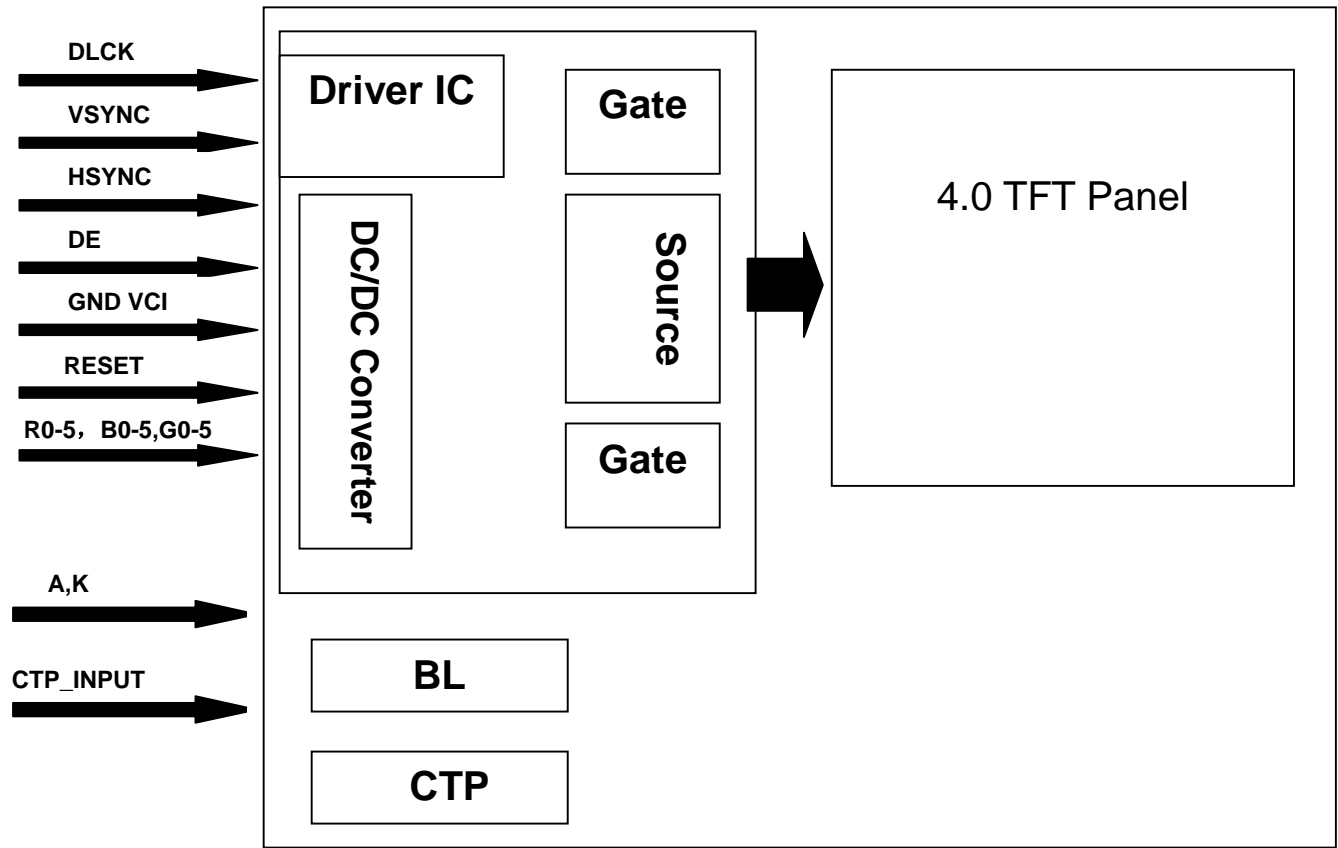
| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-----------------|--------|-----|------|-----|------|--------|
| Forward Current | I_F | -- | 40 | 50 | mA | |
| Forward Voltage | V_F | - | 12.8 | - | V | |
| Connection mode | | -- | 4S2P | -- | | |
| LED number | / | | 8 | | pcs | |

Note1: Optical performance should be evaluated at Ta=25°C only .If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



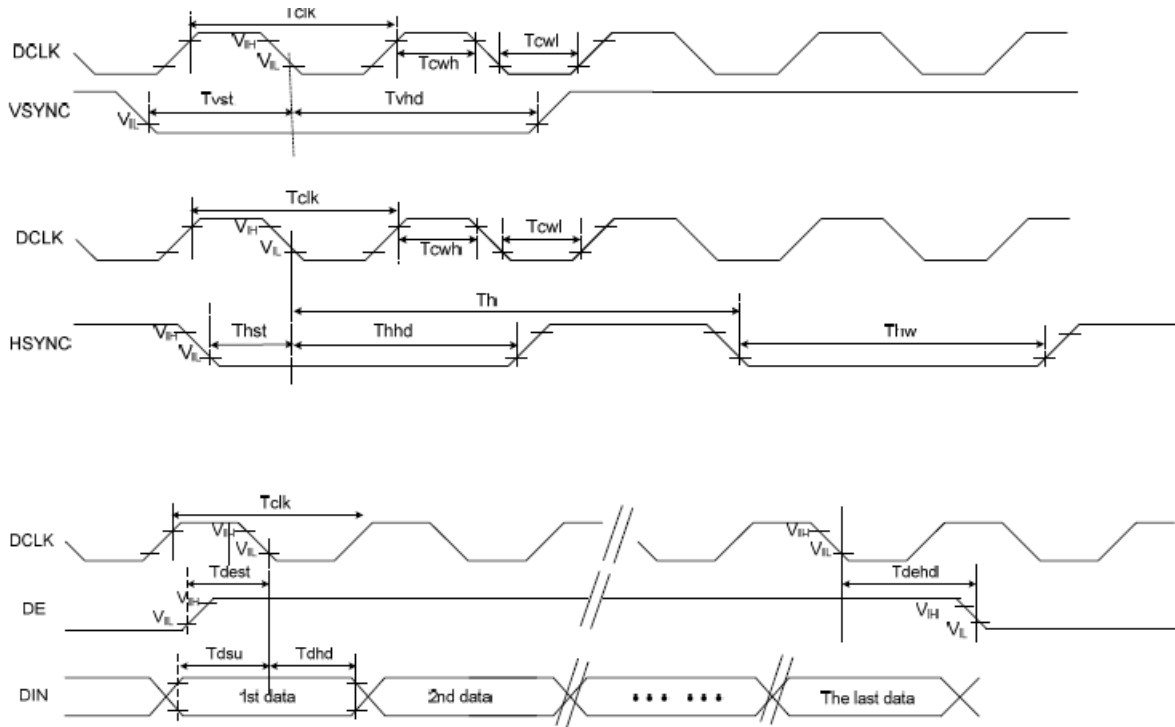
BLU CIRCUIT DIAGRAM

4.3 Block Diagram



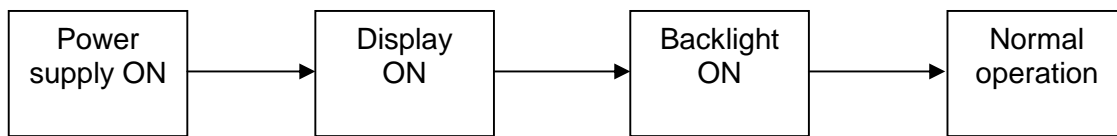
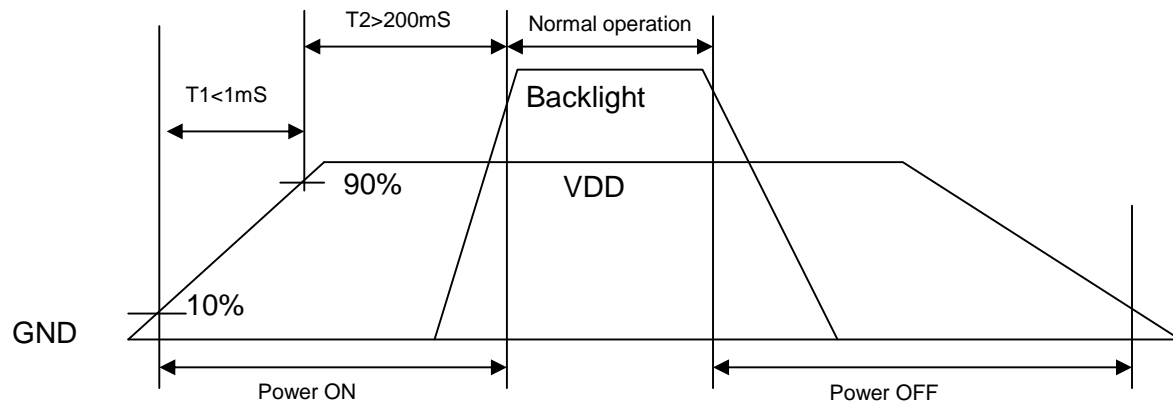
5 INTERFACE TIMING

5.1 System Bus Read/Write Characteristics.

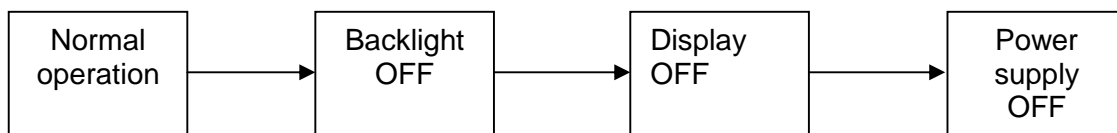


| Parameters | Symbols | Min | Typ | Max | Unit |
|----------------------------|---------|-----|-----|-----|-------|
| Horizontal Synchronization | Hsync | | 20 | - | PCLK |
| Horizontal Back Porch | HBP | | 20 | - | PCLK |
| Horizontal Front Porch | HFP | | 10 | - | PCLK |
| Horizontal Address | HAdr | | 720 | - | PCLK |
| Vertical Synchronization | Vsync | | 10 | - | HSYNC |
| Vertical Back Porch | VBP | | 10 | - | HSYNC |
| Vertical Front Porch | VFP | | 10 | - | HSYNC |
| Vertical Address | VAdr | | 720 | - | HSYNC |

5.2 Power ON/OFF Timing



Power ON sequence



Power OFF sequence

6 Optical Characteristics

Ta=25℃

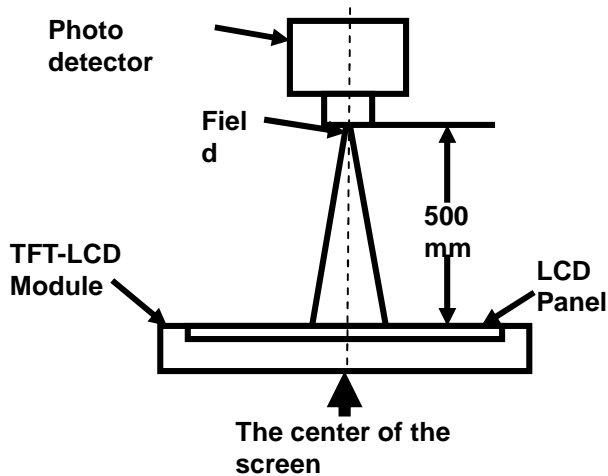
| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|----------------|------------|------------------|-----|-----|-----|-------------------|----------------|
| View Angles | θT | $CR \geq 10$ | - | 80 | - | Degree | Note 2 |
| | θB | | - | 80 | - | | |
| | θL | | - | 80 | - | | |
| | θR | | - | 80 | - | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 700 | 900 | - | - | Note1 Note3 |
| Response Time | T_{ON} | 25℃ | - | 30 | 40 | ms | Note1 Note4 |
| | T_{OFF} | | | | | | |
| Uniformity | U | - | 70 | 80 | - | % | Note1 Note6 |
| NTSC | - | - | - | 70 | - | % | Note 5 |
| Luminance | L | | 250 | 300 | - | cd/m ² | Note1 Note7 |

Test Conditions:

1. $V_F=12.8V$, $I_F=40mA$, the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| Item | Photo detector | Field |
|----------------|----------------|-------|
| Contrast Ratio | SR-3A | 1° |
| Luminance | | |
| Chromaticity | | |
| Lum Uniformity | | |
| Response Time | BM-7A | 2° |

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

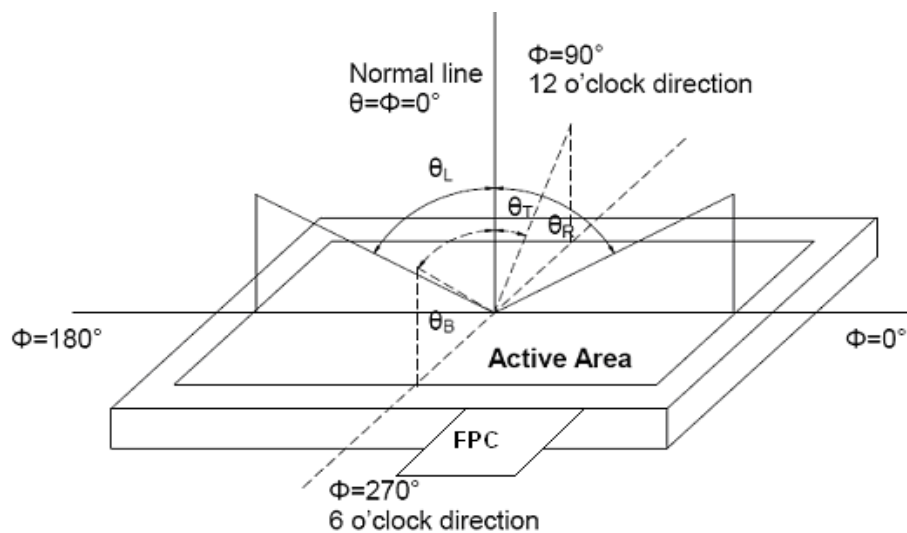


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

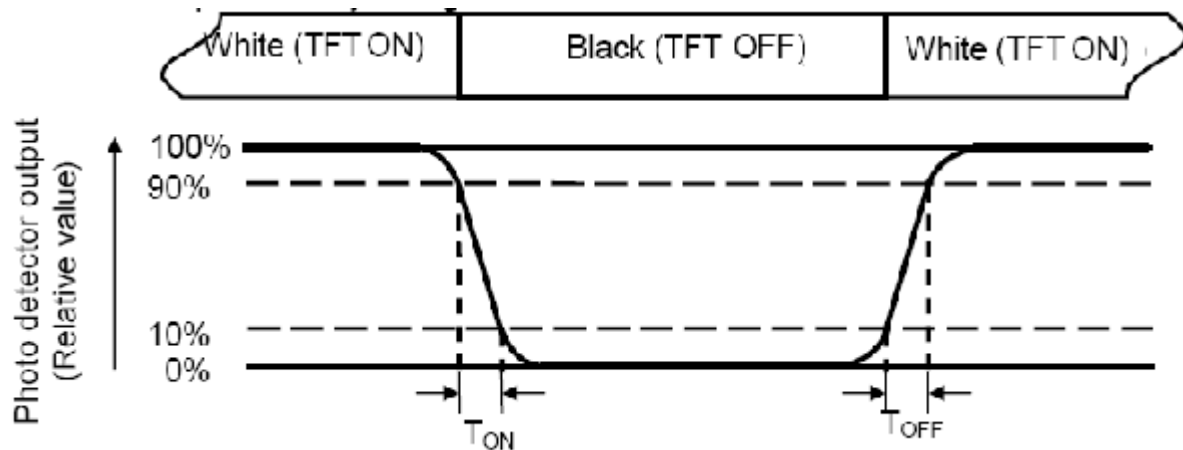
“White state “:The state is that the LCD should be driven by V_{white}.

“Black state”: The state is that the LCD should be driven by V_{black}.

V_{white}: To be determined V_{black}: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

**Note 5: Definition of color chromaticity (CIE1931)**

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = L_{min} / L_{max}

L-----Active area length W----- Active area width

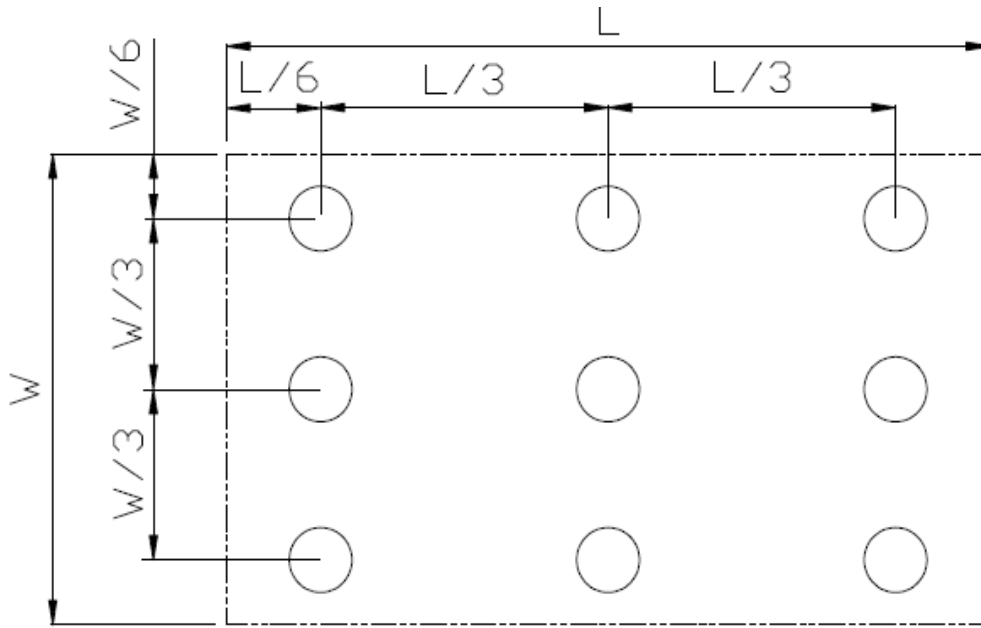


Fig. 2 Definition of uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : The measured minimum luminance of all measurement position.

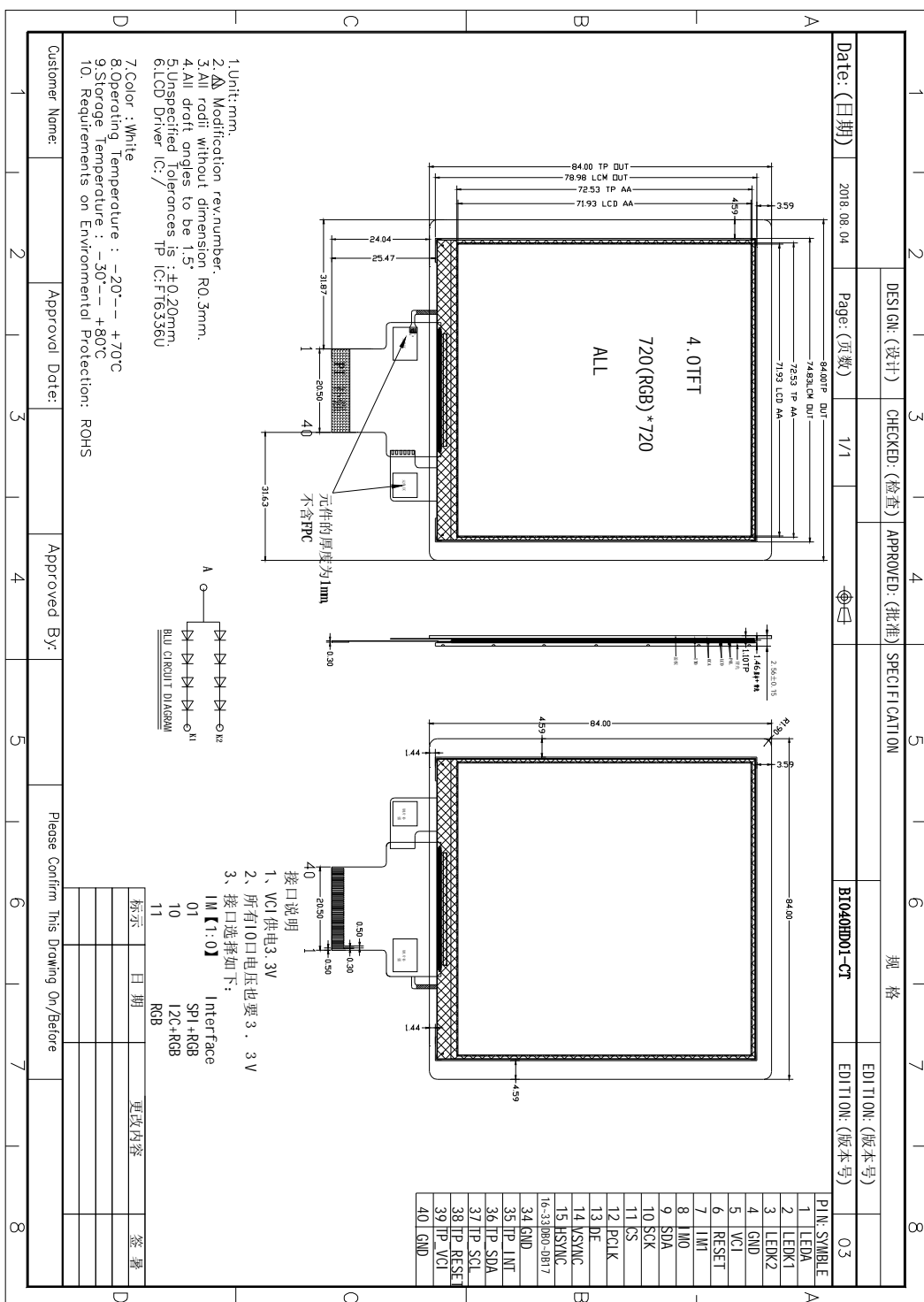
Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

| Item | Condition | Time (hrs) | Assessment |
|---------------------------------|--|------------|--|
| High temp. Storage | 80°C | 120 | No abnormalities in functions and appearance |
| High temp. Operating | 70°C | 120 | |
| Low temp. Storage | -30°C | 120 | |
| Low temp. Operating | -20°C | 120 | |
| Humidity | 40°C/ 90%RH | 120 | |
| Thermal Shock(Non-operation) | -20°C → 25°C ® 70°C (0.5 hour → 5 min ® 0.5 hour) | 10cycles | |

8 Mechanical Drawing



9 Precautions For Use of LCD Modules

9.1 Handling Precautions

9.1.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

9.1.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

9.1.1.6 Do not attempt to disassemble the LCD Module.

9.1.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

9.1.1.9 Be sure to ground the body when handling the LCD Modules.

9.1.1.10 Tools required for assembly, such as soldering irons, must be properly ground.

9.1.1.11 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

9.1.1.12 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

9.1.1.13 Storage precautions

9.1.1.14 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.1.1.15 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

9.1.1.16 Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

9.1.1.17 The LCD modules should be stored in the room without acid, alkali and harmful gas.

9.2 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.
