



MODEL NO. : TM024HBH39

ISSUED DATE: 2010-3-26

VERSION : Ver 2.0

- Preliminary Specification
- Final Product Specification

Customer : _____

| Approved by | Notes |
|-------------|-------|
| | |

SHANGHAI TIANMA Confirmed :

| Prepared by | Checked by | Approved by |
|-------------|------------|-------------|
| | | |

This technical specification is subjected to change without notice



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Record of Revision

| Rev | Issued Date | Description | Editor |
|-----|-------------|-----------------------------------|-------------|
| 1.0 | 2009-12-02 | Preliminary Specification Release | Bencan Yang |
| 2.0 | 2010-3-26 | Final specification release | Bencan Yang |
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1 General Specifications

| | Feature | Spec |
|-----------------------------------|---------------------------------|------------------------|
| Display Spec | Size | 2.4 inch |
| | Resolution | 240(RGB) x 320 |
| | Interface | CPU 8/9/16/18 bits |
| | Color Depth | 262k |
| | Technology Type | a-Si |
| | Pixel Pitch (mm) | 0.153x 0.153 |
| | Pixel Configuration | R.G.B Vertical Stripe |
| | Display Mode | TM with Normally White |
| | Surface Treatment(Up Polarizer) | Clear Type (3H) |
| | Viewing Direction | 6 o'clock |
| | Gray Scale Inversion Direction | 12 o'clock |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 42.72x60.26x3.40 |
| | Active Area(mm) | 36.72 x 48.96 |
| | With /Without TSP | With TSP |
| | Weight (g) | 14.56 |
| | LED Numbers | 3 LEDs |
| Electronic | Driver IC | HX8347G |

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: $\pm 5\%$



2 Input/Output Terminals

2.1 TFT LCD Panel

| No | Symbol | I/O | Description | Comment |
|----|--------|-----|--|----------|
| 1 | GND | P | Power Ground | |
| 2 | Y- | I/O | Touch panel coordinate in the down side of envisage drawing | |
| 3 | X- | I/O | Touch panel coordinate in the right side of envisage drawing | |
| 4 | Y+ | I/O | Touch panel coordinate in the up side of envisage drawing | |
| 5 | X+ | I/O | Touch panel coordinate in the left side of envisage drawing | |
| 6 | GND | P | Power Ground | |
| 7 | IM0 | I | Mode select | |
| 8 | IM3 | I | Mode select | Note2 |
| 9 | NC | - | Floating | |
| 10 | NC | - | Floating | |
| 11 | LCD_ID | O | LCD identify | Floating |
| 12 | RESET | I | Reset signal | |
| 13 | D9 | I | Data Input | |
| 14 | D0 | I | Data Input | |
| 15 | D17 | I | Data Input | |
| 16 | D16 | I | Data Input | |
| 17 | D15 | I | Data Input | |
| 18 | D14 | I | Data Input | |
| 19 | D13 | I | Data Input | |
| 20 | D12 | I | Data Input | |
| 21 | D11 | I | Data Input | |
| 22 | D10 | I | Data Input | |
| 23 | D8 | I | Data input | |
| 24 | D7 | I | Data input | |
| 25 | D6 | I | Data input | |
| 26 | D5 | I | Data input | |
| 27 | D4 | I | Data input | |
| 28 | D3 | I | Data input | |
| 29 | D2 | I | Data input | |
| 30 | D1 | I | Data input | |
| 31 | RD | I | Read | |
| 32 | WR | I | Write | |
| 33 | RS | I | Register select | |
| 34 | CS | I | Chip select | |
| 35 | GND | P | Ground | |
| 36 | IOVCC | P | Power Supply of Logic Circuit | |
| 37 | VCC | P | Power Supply of Analog Circuit | |
| 38 | VCC | P | Power Supply of Analog Circuit | |
| 39 | NC | - | Floating | |
| 40 | LEDK3 | P | LED cathode | |
| 41 | LEDK2 | P | LED cathode | |

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| | | | | |
|----|-------|---|-------------|--|
| 42 | LEDK1 | P | LED cathode | |
| 43 | LEDA | P | LED anode | |
| 44 | GND | P | Ground | |

Note1: I/O definition: I----Input O---Output P----Power/ Ground NC--- Not Connected

Note2:

| IM3 | IM0 | Interface | Data Bus Use | |
|-----|-----|-------------------------|------------------|---------------|
| | | | Register/Content | GRAM |
| 0 | 0 | 8080 MCU 16bit parallel | D8~D1 | D17~D10,D8~D1 |
| 0 | 1 | 8080 MCU 8bit parallel | D17~D10 | D17~D10 |
| 1 | 0 | 8080 MCU 18bit parallel | D8~D1 | D17~D0 |
| 1 | 1 | 8080 MCU 9bit parallel | D17~D10 | D17~D9 |



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

| Item | Symbol | MIN | MAX | Unit | Remark |
|----------------------------|--|------|-----------|------|--------------|
| Logic Supply Voltage | IOVCC | -0.3 | 4.6 | V | |
| Analog Supply Voltage | VCC | -0.3 | 4.6 | V | |
| Input voltage | DB0-DB17,IM0,IM3,RD,RS,CS, WR,RESET | -0.3 | IOVCC+0.5 | V | |
| Touch Panel | Vtp | - | 7 | V | |
| Back Light Forward Current | I _{LED} | - | 25 | mA | For each LED |
| Operating Temperature | T _{OPR} | -20 | 60 | °C | |
| Storage Temperature | T _{STG} | -30 | 70 | °C | |



4 Electrical Characteristics

4.1 Driving TFT LCD Panel

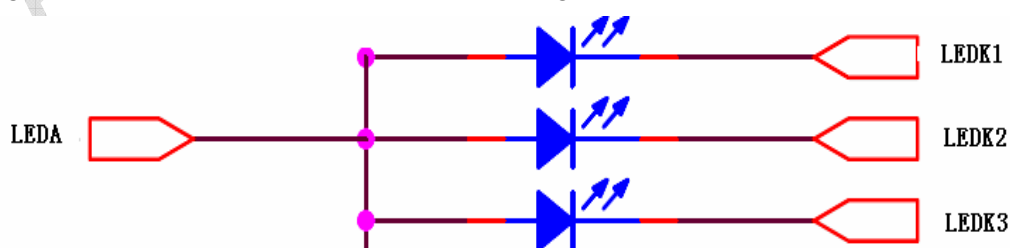
GND=0V, Ta=25°C

| Item | Symbol | MIN | TYP | MAX | Unit | Remark | |
|--------------------------------|-------------------|----------|--------------------|-----|--------------------|--------|---|
| Logic Supply Voltage | IOVCC | 1.65 | 1.8 | 3.3 | V | | |
| Analog Supply Voltage | VCC | 2.3 | 2.8 | 3.3 | V | | |
| Input Signal Voltage | Low Level | V_{IL} | $0.7 \times IOVCC$ | - | IOVCC | V | DB0-DB17, IM0, IM3, RD, RS, CS, WR, RESET |
| | High Level | V_{IH} | - | - | $0.3 \times IOVCC$ | | |
| Output Signal Voltage | Low Level | V_{OL} | $0.8 \times IOVCC$ | - | - | V | |
| | High Level | V_{OH} | - | -- | $0.2 \times IOVCC$ | V | |
| (Panel+ LSI) Power Consumption | Black Mode (60Hz) | - | TBD | - | - | mW | |
| | 8 Color Mode | - | TBD | - | - | mW | |
| | Sleeping Mode | - | TBD | - | - | mW | |

4.2 Driving Backlight Ta=25°C

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-------------------|----------|-----|-----|-----|------|--------------|
| Forward Current | I_F | - | 20 | - | mA | For each LED |
| Forward Voltage | V_F | 2.9 | 3.2 | 3.4 | V | For each LED |
| Power Consumption | W_{BL} | - | 192 | - | mW | 3 LEDs |

Note1: Figure below shows the connection of backlight LED.



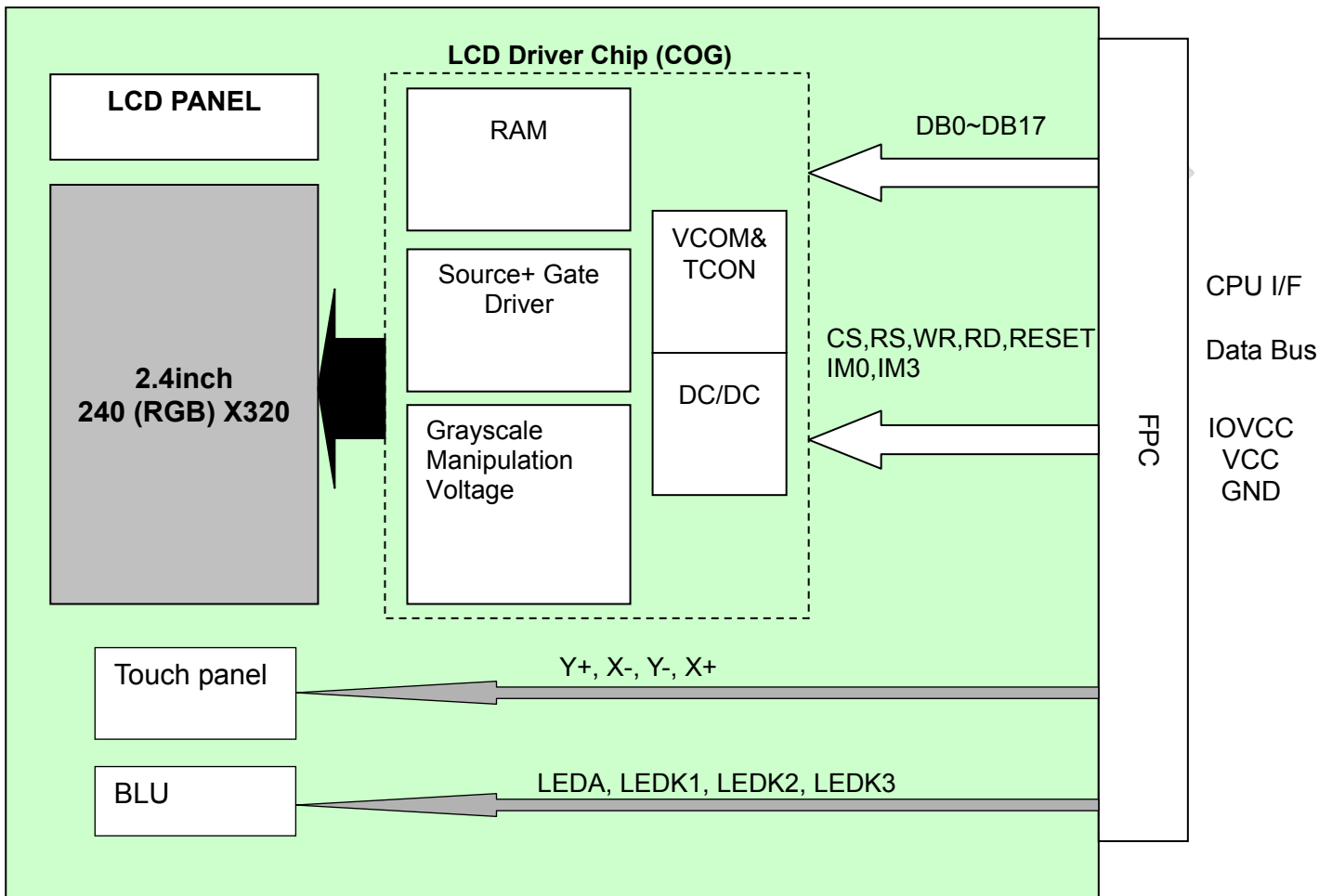
Note 2: One LED: $1/3 \times I_F = 20 \text{ mA}$, $V_F = 3.2 \text{ V}$

Note 3: The life of LED: 20,000 hours

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4.3 Block Diagram





5 Timing Chart

5.1 Interface Characteristics

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, T_A = -30 to 70° C)

| Signal | Symbol | Parameter | Spec. | | | Unit | Description |
|-------------|--------|------------------------------------|-------|-----|------|------|---|
| | | | Min. | Typ | Max. | | |
| DNC_SCL | tAST | Address setup time | 10 | - | - | ns | - |
| | tAHT | Address hold time (Write/Read) | 10 | - | - | | |
| NCS | tCHW | Chip select "H" pulse width | 0 | - | - | ns | - |
| | tCS | Chip select setup time (Write) | 15 | - | - | | |
| | tRCS | Chip select setup time (Read ID) | 45 | - | - | | |
| | tRCSFM | Chip select setup time (Read FM) | 355 | - | - | | |
| | tCSF | Chip select wait time (Write/Read) | 10 | - | - | | |
| | tCSH | Chip select hold time | 10 | - | - | | |
| NWR_SCL | tWC | Write cycle | 66 | - | - | ns | - |
| | tWRH | Control pulse "H" duration | 15 | - | - | | |
| | tWRL | Control pulse "L" duration | 15 | - | - | | |
| NRD(ID) | tRC | Read cycle (ID) | 160 | - | - | ns | When read ID data |
| | tRDH | Control pulse "H" duration (ID) | 90 | - | - | | |
| | tRDL | Control pulse "L" duration (ID) | 45 | - | - | | |
| NRD(FM) | tRCFM | Read cycle (FM) | 450 | - | - | ns | When read from frame memory |
| | tRDHFM | Control pulse "H" duration (FM) | 90 | - | - | | |
| | tRDLFM | Control pulse "L" duration (FM) | 355 | - | - | | |
| DB17 to DB0 | tDST | Data setup time | 10 | - | - | ns | For maximum CL=30pF For minimum CL=8pF |
| | tDHT | Data hold time | 10 | - | - | | |
| | tRAT | Read access time (ID) | - | - | 100 | | |
| | tRATFM | Read access time (FM) | - | - | 340 | | |
| | tODH | Output disable time | 20 | - | 80 | | |

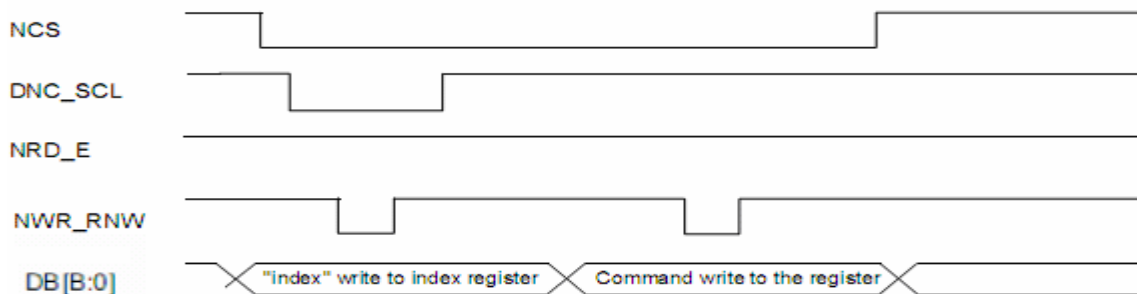
Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

Parallel interface characteristics

5.2 Registr Write/Read Timing Parameter

a. Write to register



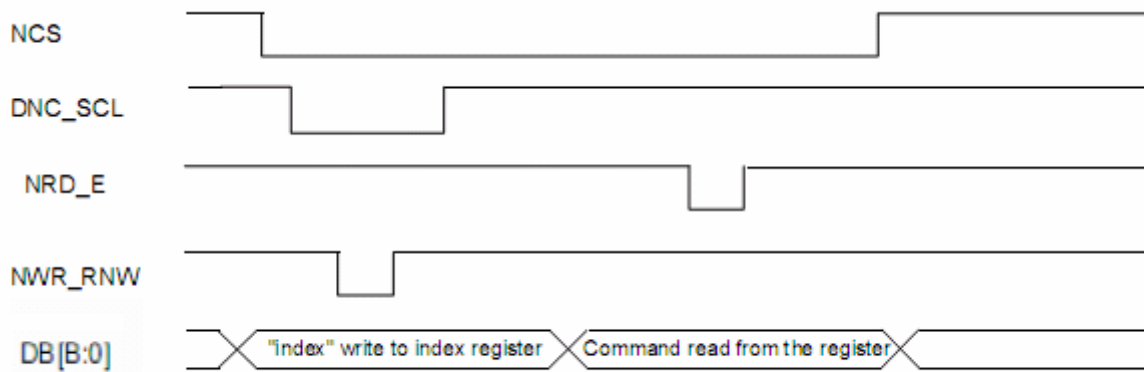
NOTE: DB[B:0] means the data bus which is defined by IM0 and IM3, see spec 2.1 NOTE 2.

Figure 5.1 Register write timing in parallel bus system interface (for I80 series MPU)

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b. Read to register



NOTE: DB[B:0] means the data bus which is defined by IM0 and IM3, see spec 2.1 NOTE 2.

Figure 5.2 Register read timing in parallel bus system interface (for i80 series MPU)

5.3 GRAM write timing in i80 series system

| Register Command | DB17 | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Command |
|------------------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------------------------|
| 17H | x | x | x | x | x | x | x | x | x | x | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 22H |
| 03h | x | x | x | x | x | x | x | x | x | x | R3 | R2 | R1 | R0 | G3 | G2 | G1 | G0 | Color |
| | x | x | x | x | x | x | x | x | x | x | B3 | B2 | B1 | B0 | R3 | R2 | R1 | R0 | 4K-Color (2-pixels/ 3-bytes) |
| | x | x | x | x | x | x | x | x | x | x | G3 | G2 | G1 | G0 | B3 | B2 | B1 | B0 | |
| 05h | x | x | x | x | x | x | x | x | x | x | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | 65K-Color (1-pixel/ 2-bytes) |
| | x | x | x | x | x | x | x | x | x | x | G2 | G1 | G0 | B4 | B3 | B2 | B1 | B0 | |
| 06h | x | x | x | x | x | x | x | x | x | x | R5 | R4 | R3 | R2 | R1 | R0 | x | x | 262K-Color (1-pixel/ 3bytes) |
| | x | x | x | x | x | x | x | x | x | x | G5 | G4 | G3 | G2 | G1 | G0 | x | x | |
| | x | x | x | x | x | x | x | x | x | x | B5 | B4 | B3 | B2 | B1 | B0 | x | x | |

Table 5.3.1 8 bit parallel interface GRAM write table

| Register Command | DB17 | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Command |
|------------------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------------------------|
| 17H | x | x | x | x | x | x | x | x | x | x | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 22H |
| 03h | | | | | | | | | | | R3 | R2 | R1 | R0 | G3 | G2 | G1 | G0 | Color |
| 05h | x | x | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | 4K-Color |
| 06h | x | x | R5 | R4 | R3 | R2 | R1 | R0 | x | x | G5 | G4 | G3 | G2 | G1 | G0 | x | x | 65K-Color |
| | x | x | B5 | B4 | B3 | B2 | B1 | B0 | x | x | R5 | R4 | R3 | R2 | R1 | R0 | x | x | 262K-Color (2-pixels/ 3bytes) |
| | x | x | G5 | G4 | G3 | G2 | G1 | G0 | x | x | B5 | B4 | B3 | B2 | B1 | B0 | x | x | |
| 07h | x | x | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | 262K-Color (16+2) |
| | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x | B1 | B0 | |

Table 5.3.2 16bit parallel interface GRAM write table

| Register Command | DB17 | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Register |
|------------------|------|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------------------------|
| 17H | x | x | x | x | x | x | x | x | x | x | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 22H |
| 06h | x | x | x | x | x | x | x | x | x | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | Color |
| | x | x | x | x | x | x | x | x | x | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 | 262K-Color (1-pixels/ 2bytes) |

Table 5.3.3 9 bit parallel interface GRAM write table

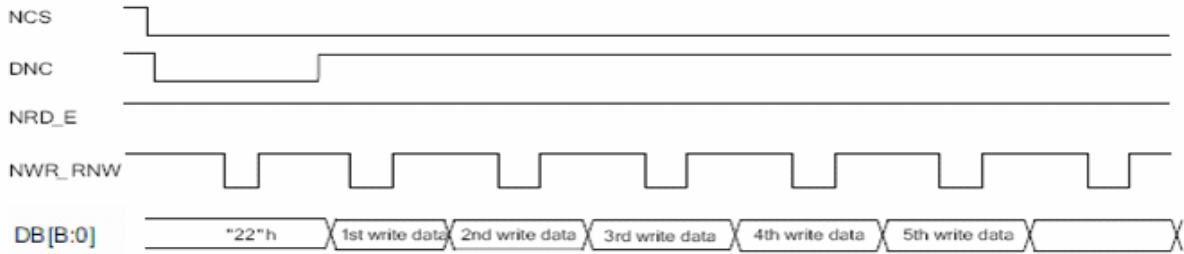
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| Register Command | DB17 | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Register |
|------------------|---|------|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------------|
| 22H | x | x | x | x | x | x | x | x | x | x | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 22H |
| 17H | DB17 <th>DB16</th> <th>DB15</th> <th>DB14</th> <th>DB13</th> <th>DB12</th> <th>DB11</th> <th>DB10</th> <th>DB9</th> <th>DB8</th> <th>DB7</th> <th>DB6</th> <th>DB5</th> <th>DB4</th> <th>DB3</th> <th>DB2</th> <th>DB1</th> <th>DB0</th> <th>Color</th> | DB16 | DB15 | DB14 | DB13 | DB12 | DB11 | DB10 | DB9 | DB8 | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | Color |
| 06h | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 | 262K-Color |

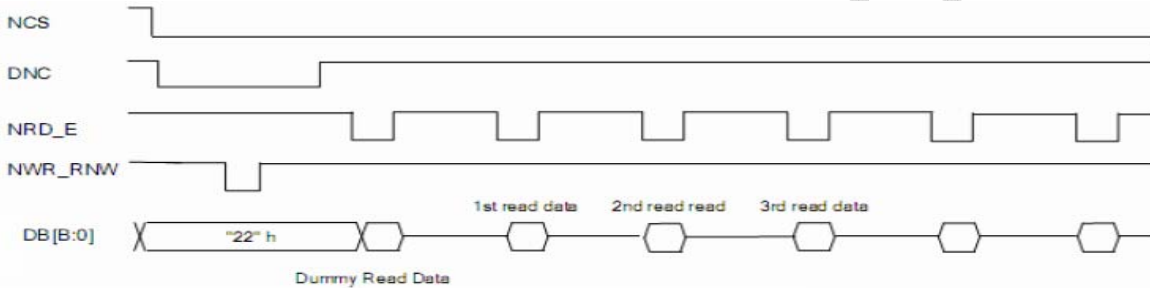
Table 5.3.4 18 bit parallel interface GRAM write table

a. Write the GRAM



NOTE: DB[B:0] means the data bus which is defined by IM0 and IM3, see spec 2.1 NOTE 2.

b. Read the GRAM



NOTE: DB[B:0] means the data bus which is defined by IM0 and IM3, see spec 2.1 NOTE 2.

5.4 Reset Timing Characteristics

| Item | Symbol | Unit | Min. | Typ. | Max. |
|---|--------|------|------|------|------|
| RESET low pulse width | tRESW | us | 10 | - | - |
| Reset complete time (STB out mode) | tREST | ms | 5 | - | |
| Reset complete time (STB mode) | | ms | 120 | | |
| Reset goes high lever after power on time | tPRES | ms | 1 | | |

Table 5.4.1 RESET Timing Parameter

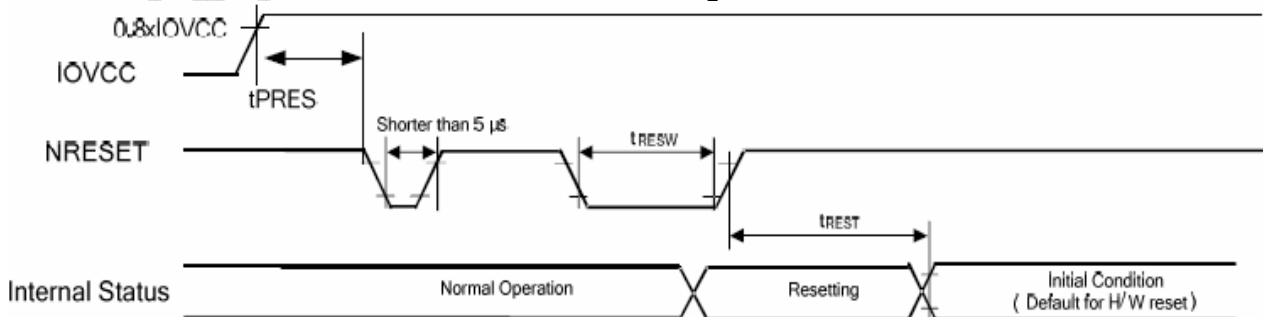


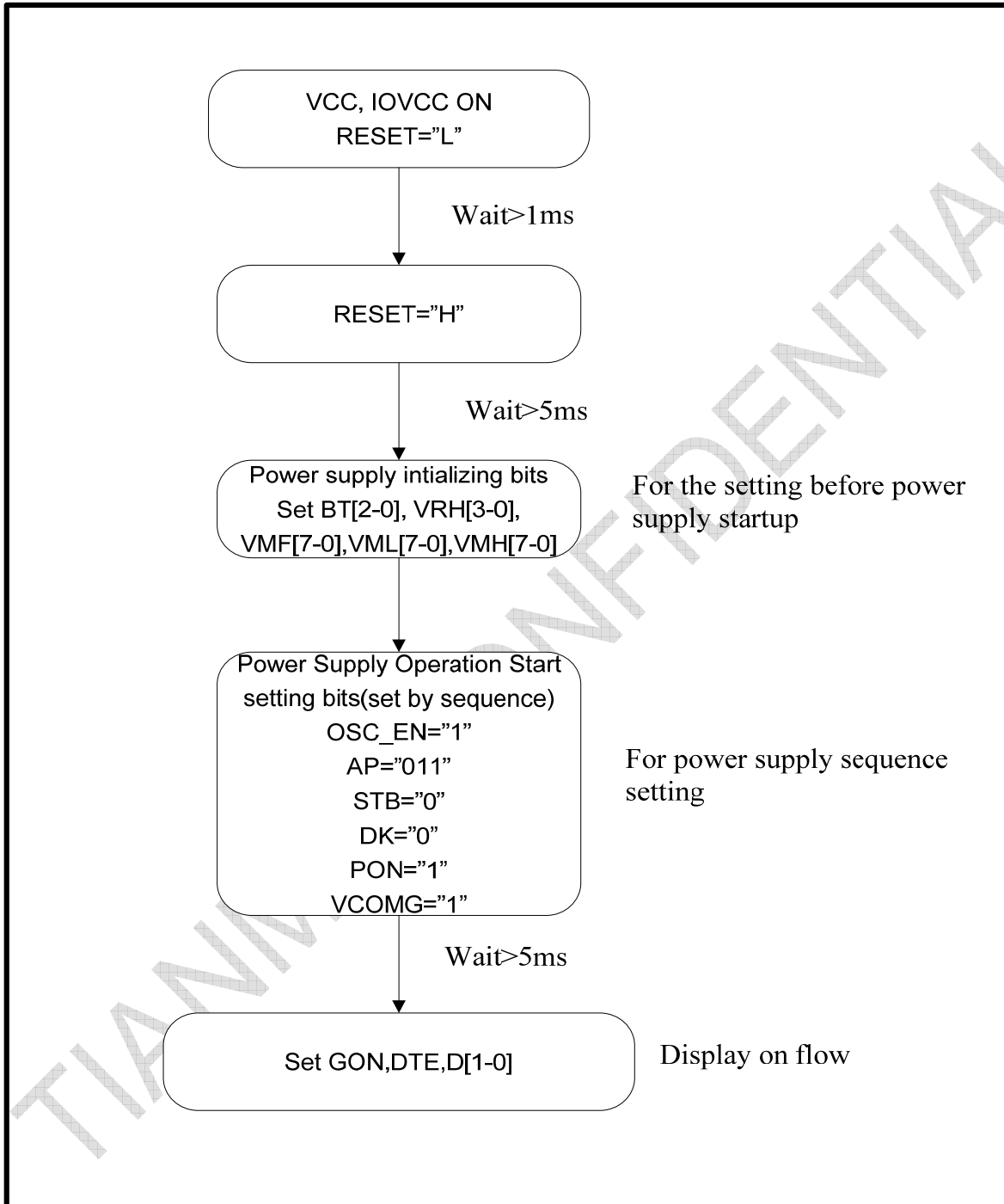
Figure 5.4.2 RESET Timing

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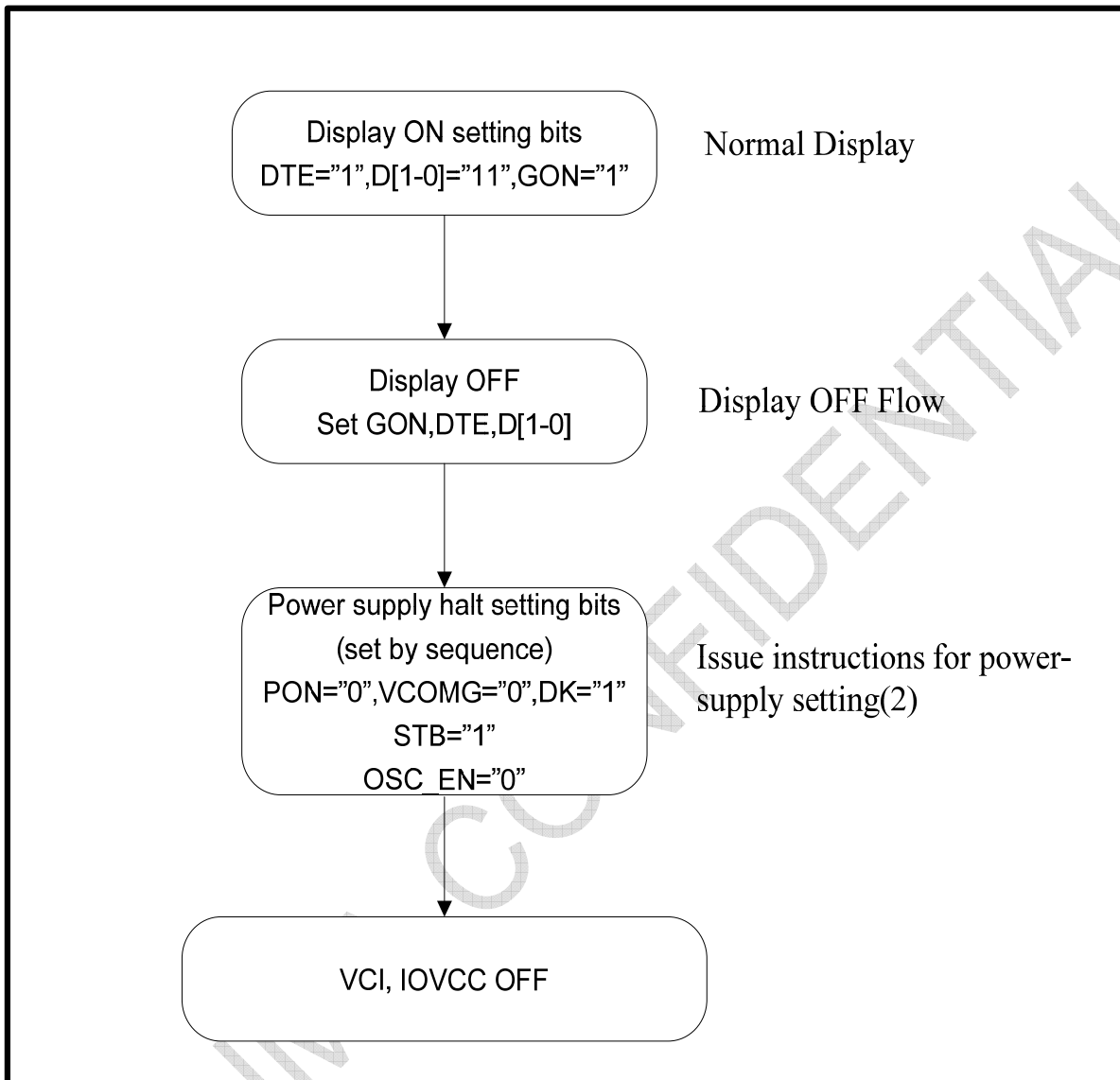
5.5 Power on/off Sequence

5.5.1 Power on sequence





5.5.2 Power off sequence





6 Optical Characteristics

Ta=25°C

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|----------------|------------|------------------|-------|-------|-------|-------------------|-----------------|
| View Angles | θT | $CR \geq 10$ | 40 | 50 | - | Degree | Note 2 |
| | θB | | 40 | 20 | - | | |
| | θL | | 15 | 45 | - | | |
| | θR | | 35 | 45 | - | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 300 | 350 | - | | Note1 Note3 |
| Response Time | Ton | 25°C | - | 20 | 30 | ms | Note1 Note4 |
| | Toff | | | | | | |
| Chromaticity | White | x | 0.235 | 0.285 | 0.335 | | Note5, Note1 |
| | | y | 0.255 | 0.305 | 0.355 | | |
| | Red | x | 0.540 | 0.590 | 0.640 | | |
| | | y | 0.280 | 0.330 | 0.380 | | |
| | Green | x | 0.280 | 0.330 | 0.380 | | |
| | | y | 0.530 | 0.580 | 0.630 | | |
| | Blue | x | 0.110 | 0.150 | 0.200 | | |
| | | y | 0.050 | 0.100 | 0.150 | | |
| Uniformity | U | | - | 80 | - | % | Note1 Note6 |
| NTSC | | | - | 50 | - | % | Note 5 |
| Luminance | L | | 160 | 180 | - | cd/m ² | Note1 Note7 |

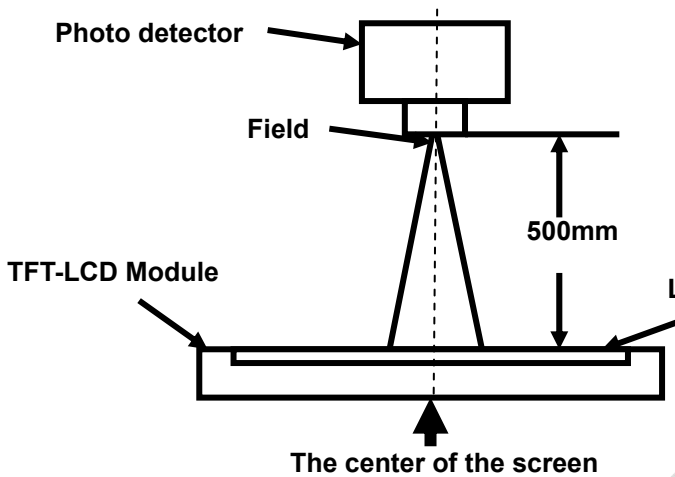
Test Conditions:

1. For one LED: $V_F=3.2V$, $1/3xI_F=20mA$, the ambient temperature is 25°C.
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).

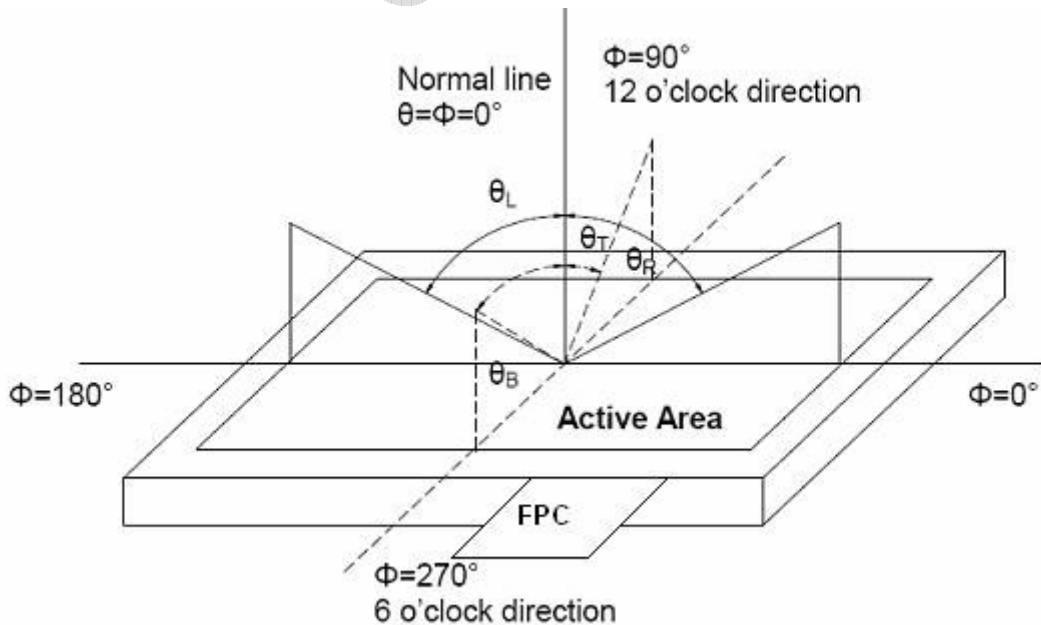


Fig. 1 Definition of viewing angle



Note 3: Definition of contrast ratio

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

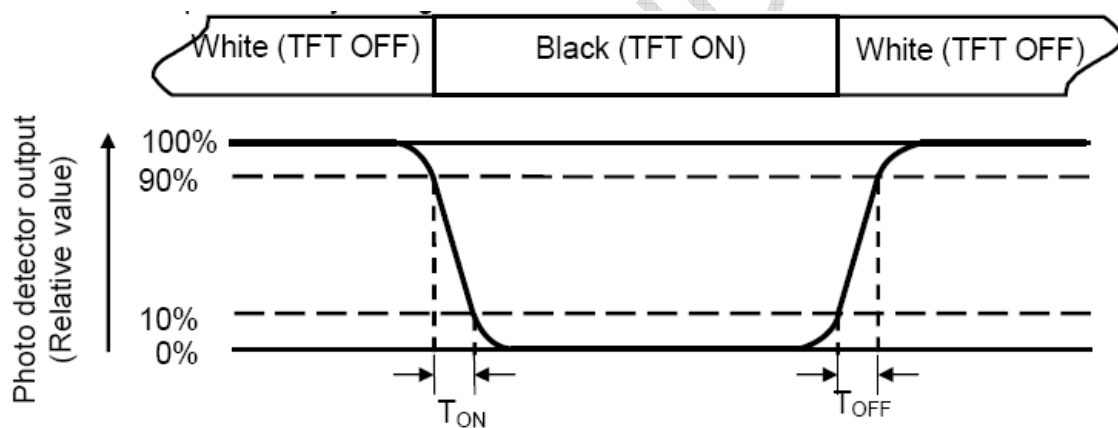
"White state": The state is that the LCD should be driven by V_{white} .

"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.

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

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

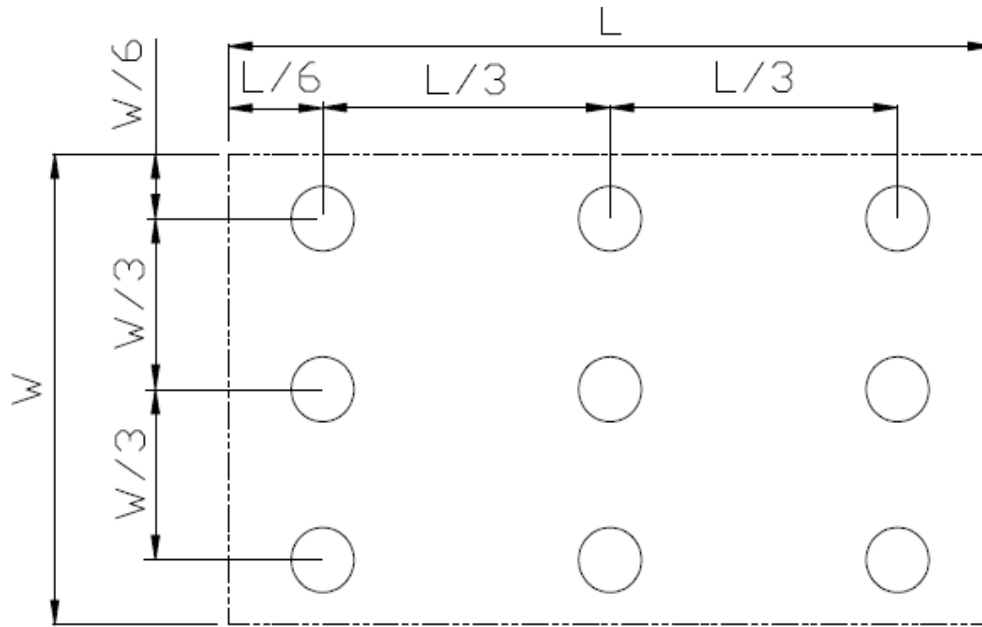


Fig. 2 Definition of uniformity

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 Tests

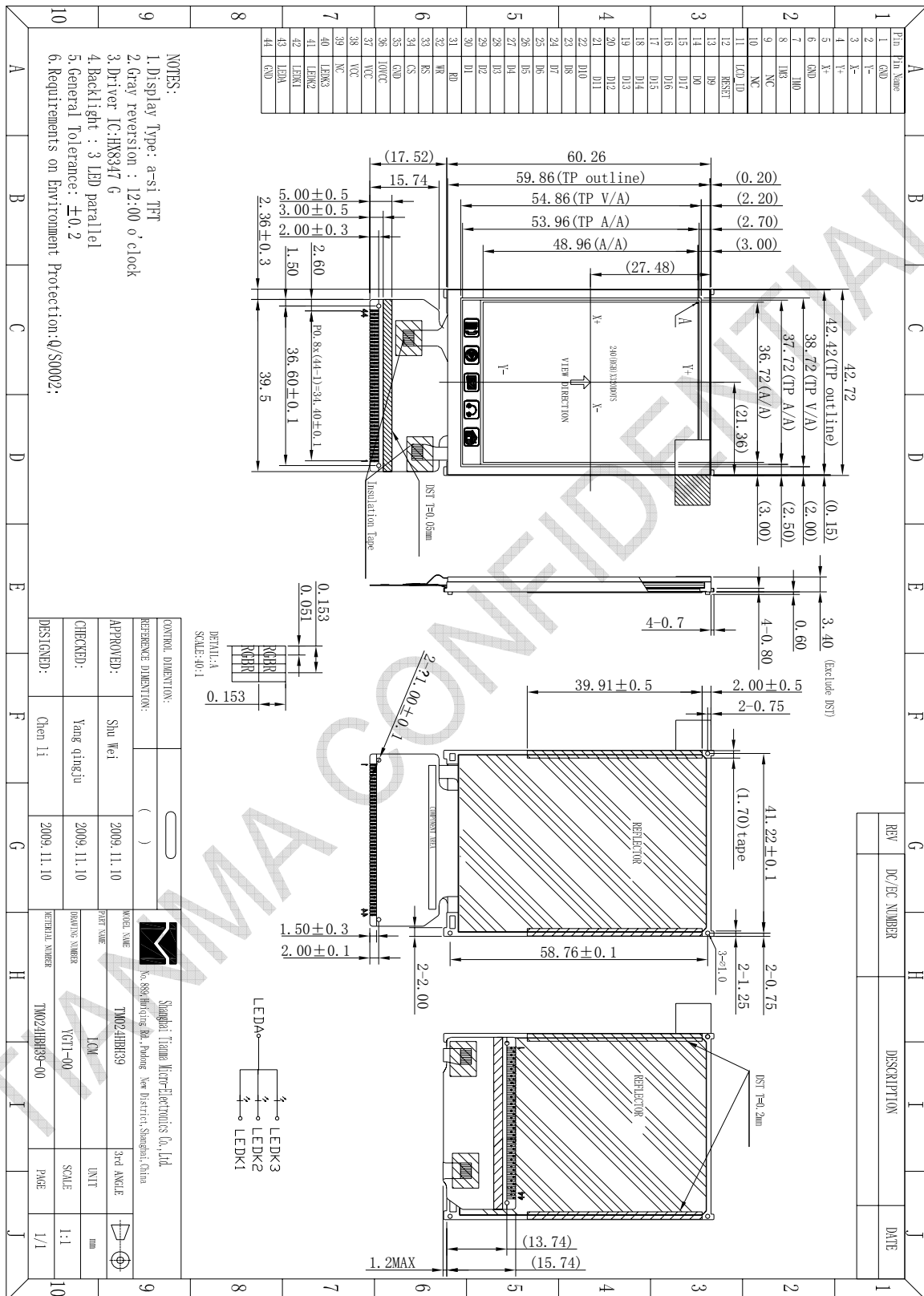
| No | Test Item | Condition | Remarks |
|----|--|--|---|
| 1 | High Temperature Operation | Ts=+60°C, 240hrs | Note1 IEC60068-2-1:2007,GB2423.2-2008 |
| 2 | Low Temperature Operation | Ta=-20°C, 240hrs | IEC60068-2-1:2007 GB2423.1-2008 |
| 3 | High Temperature Storage | Ta=+70°C, 240hrs | IEC60068-2-1:2007 GB2423.2-2008 |
| 4 | Low Temperature Storage | Ta=-30°C, 240hrs | IEC60068-2-1:2007 GB2423.1-2008 |
| 5 | High Temperature & High Humidity Storage | Ta=+60°C, 90% RH 240 hours | Note2 IEC60068-2-78 :2001 GB/T2423.3—2006 |
| 6 | Thermal Shock (Non-operation) | -30°C 30 min~+70°C 30 min, Change time:5min, 20 Cycles | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002 |
| 7 | Electro Static Discharge (Operation) | C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; (Environment: 15°C~35°C, 30%~60%, 86Kpa~106Kpa) | IEC61000-4-2:2001 GB/T17626.2-2006 |
| 8 | Vibration (Non-operation) | Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz hours for each direction of X.Y.Z. (6 hours for total) (Package condition) | 2 IEC60068-2-6:1982 GB/T2423.10—1995 |
| 9 | Shock (Non-operation) | 60G 6ms, ±X,±Y,±Z 3times, for each direction | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 10 | Package Drop Test | Height:80 cm, 1 corner, 3 edges, 6 surfaces | IEC60068-2-32:1990 GB/T2423.8—1995 |

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.



8 Mechanical Drawing

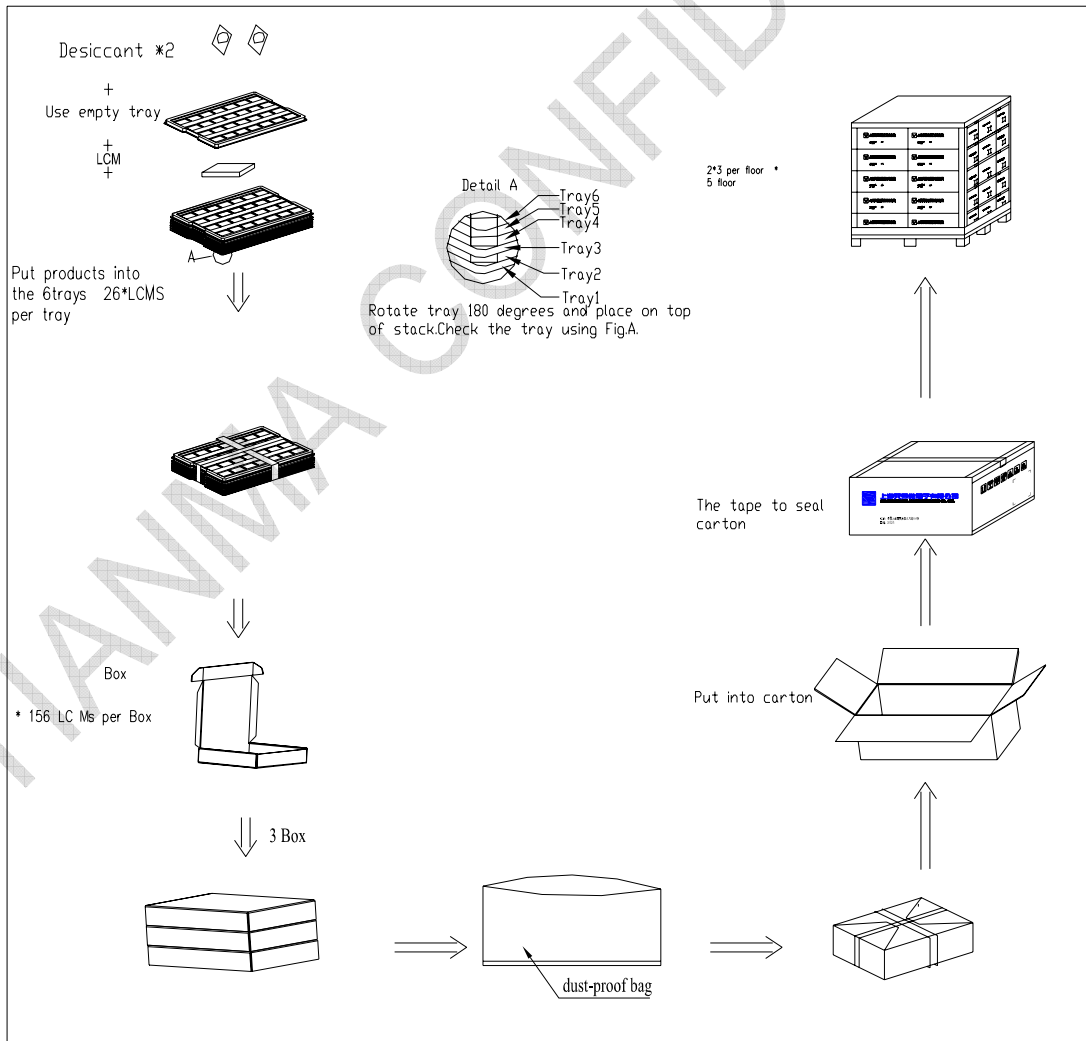


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9 Packing Drawing

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark |
|----|----------------|------------------|------------------|-----------------|----------|-------------|
| 1 | LCM module | TM024HBH39 | 42.72x60.26x3.40 | 0.01456 | 468 | |
| 2 | Tray | PET (Transmit) | 485X330X13.8 | 0.167 | 26 | Anti-static |
| 3 | Dust-Proof Bag | Dust-Proof Bag | 700x545 | 0.021 | 1 | |
| 4 | BOX | CORRUGATED PAPER | 520x345x74 | 0.227 | 3 | |
| 5 | Desiccant | Desiccant | 45×50 | 0.0035 | 6 | |
| 6 | Carton | CORRUGATED PAPER | 544×365×250 | 1.01 | 1 | |
| 7 | Total weight | | 12.89 | | | |



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10 Precautions for Use of LCD Modules

11.1 Handling Precautions

- 11.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- 11.1.2 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.
- 11.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- 11.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- 11.1.5 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 alcoholSolvents other than those mentioned above may damage the polarizer. Especially, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- 11.1.6 Do not attempt to disassemble the LCD Module.
- 11.1.7 If the logic circuit power is off, do not apply the input signals.
- 11.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - 11.1.8.1 Be sure to ground the body when handling the LCD Modules.
 - 11.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.
 - 11.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - 11.1.8.4 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.

11.2 Storage precautions

- 11.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- 11.2.2 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:
Temperature : 0°C ~ 40°C Relatively humidity: ≤80%
- 11.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions:

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