# TFT LCD Approval Specification

# MODEL NO.: V420H1 – LN3

Customer: _____

Approved by: _____

Note:

| Approved By | TV Head Division. |  |
| --- | --- | --- |
|  | LY Chen |  |

| Reviewed By | QA Dept. | Product Development Div. |
| --- | --- | --- |
|  | Tomy Chen | WT Lin |

| Prepared By | LCD TV Marketing and Product Management Div. | |
| --- | --- | --- |
|  | Wang-Yang Li | Sisley Wu |

1

Version 2.0

# - CONTENTS -

**Version 2.0**

## REVISION HISTORY

| Version | Date | Page | Section | Description |
|---------|------|------|---------|-------------|
| Ver. 0.0 | Oct 31, 2008 | All | All | The tentative specification was first issued. |
| Ver.2.0 | Dec.31.2008 | 10 | 3.2 | |
| | | 23 | 7.1 | |
| | | 29 | 10.1 | |
| | | | 10.2 | |
| | | | | |
| | | | | |
| | | | | |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

V420H1-LN3 is a 42" TFT Liquid Crystal Display module with 16-CCFL backlight unit and 2ch-LVDS interface. This module supports 1920 x 1080 HDTV format and can display true 16.7M colors (8-bit/color).

## 1.2 FEATURES

- High brightness (450 nits)

- High contrast ratio (4000:1)

- Fast response time (Gray to gray average 6.5 ms)

- High color saturation (NTSC 72%)

- Full HDTV (1920 x 1080 pixels) resolution, true HDTV format

- DE (Data Enable) only mode

- LVDS (Low Voltage Differential Signaling) interface

- Optimized response time for 60/50 Hz frame rate

- Ultra wide viewing angle : Super MVA technology

- 180 degree rotation display option

- RoHS compliance

## 1.3 APPLICATION

- Standard Living Room TVs.

- Public Display Application.

- Home Theater Application.

- MFM Application.

## 1.4 GENERAL SPECIFICATIONS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 930.24(H) x 523.26 (V) (42.02" diagonal) | mm | (1) |
| Bezel Opening Area | 939(H) x 531(V) | mm | |
| Driver Element | a-si TFT active matrix | - | - |
| Pixel Number | 1920x R.G.B. x 1080 | pixel | - |
| Pixel Pitch(Sub Pixel) | 0.1615 (H) x 0.4845 (V) | mm | - |
| Pixel Arrangement | RGB vertical stripe | - | - |
| Display Colors | 16.7M | color | - |
| Display Operation Mode | Transmissive mode / Normally black | - | - |
| Surface Treatment | Anti-Glare coating (Haze 25%) Hard coating (3H) | - | (2) |

Note (1)  Please refer to the attached drawings in chapter 9 for more information about the front and back outlines.

Note (2)  The spec of the surface treatment is temporarily for this phase. CMO reserves the rights to change this feature.

## 1.5 MECHANICAL SPECIFICATIONS

| | Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal (H) | 982.0 | 983.0 | 984.0 | mm | (1), (2) |
| | Vertical (V) | 575.0 | 576.0 | 577.0 | mm | |
| | Depth (D) | 47.9 | 48.9 | 49.9 | mm | |
| Weight | | | 11900 | | g | - |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Module Depth does not include connectors.

**Version 2.0**

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|------|--------|-------|-----|------|------|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | -20 | +60 | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | 50 | ºC | (1), (2) |
| Shock (Non-Operating) | $S_{NOP}$ | - | 50 | G | (3), (5) |
| Vibration (Non-Operating) | $V_{NOP}$ | - | 1.0 | G | (4), (5) |

Note (1) Temperature and relative humidity range is shown in the figure below.

   (a) 90 %RH Max. (Ta $\leq$ 40 ºC).

   (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

   (c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



Relative Humidity (%RH)

6

**Version 2.0**
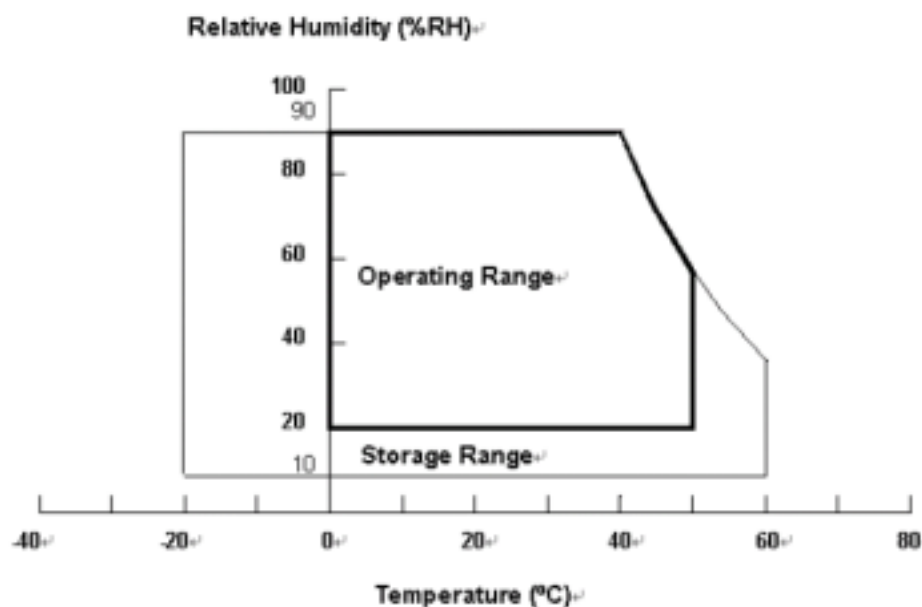
## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|------|--------|-------|-------|------|------|
| | | Min. | Max. | | |
| Power Supply Voltage | $V_{CC}$ | -0.3 | 13.5 | V | (1) |
| Logic Input Voltage | $V_{IN}$ | -0.3 | 3.6 | V | |

### 2.2.2 BACKLIGHT UNIT

| Item | Symbol | Value | | Unit | Note |
|------|--------|-------|-------|------|------|
| | | Min. | Max. | | |
| Lamp Voltage | $V_W$ | — | 3000 | $V_{RMS}$ | |
| Power Supply Voltage | $V_{BL}$ | 0 | 30 | V | (1) |

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) No moisture condensation or freezing.

**Version 2.0**

## 3. ELECTRICAL CHARACTERISTICS

### 3.1 TFT LCD MODULE   (Ta = 25 ± 2 ºC)

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | $V_{CC}$ | 10.8 | 12 | 13.2 | V | (1) |
| Power Supply Ripple Voltage | | $V_{RP}$ | - | - | 350 | mV | |
| Rush Current | | $I_{RUSH}$ | - | - | 5.0 | A | (2) |
| Power Supply Current | White | - | | 1.35 | 2.0 | A | |
| | Black | - | | 0.55 | | A | |
| | Vertical Stripe | - | | 1.26 | | A | (3) |
| LVDS Interface | Common Input Voltage | $V_{LVC}$ | 1.125 | 1.25 | 1.375 | V | |
| | Terminating Resistor | $R_T$ | - | 100 | - | ohm | |
| CMOS interface | Input High Threshold Voltage | $V_{IH}$ | 2.7 | - | 3.3 | V | |
| | Input Low Threshold Voltage | $V_{IL}$ | 0 | - | 0.7 | V | |

Note (1) The module should be always operated within the above ranges.

Note (2) The duration of rush current is about 0.5mS and measurement condition is shown below:

Issue Date: Dec.31 2008
Model No.: V420H1-LN3
**Approval**
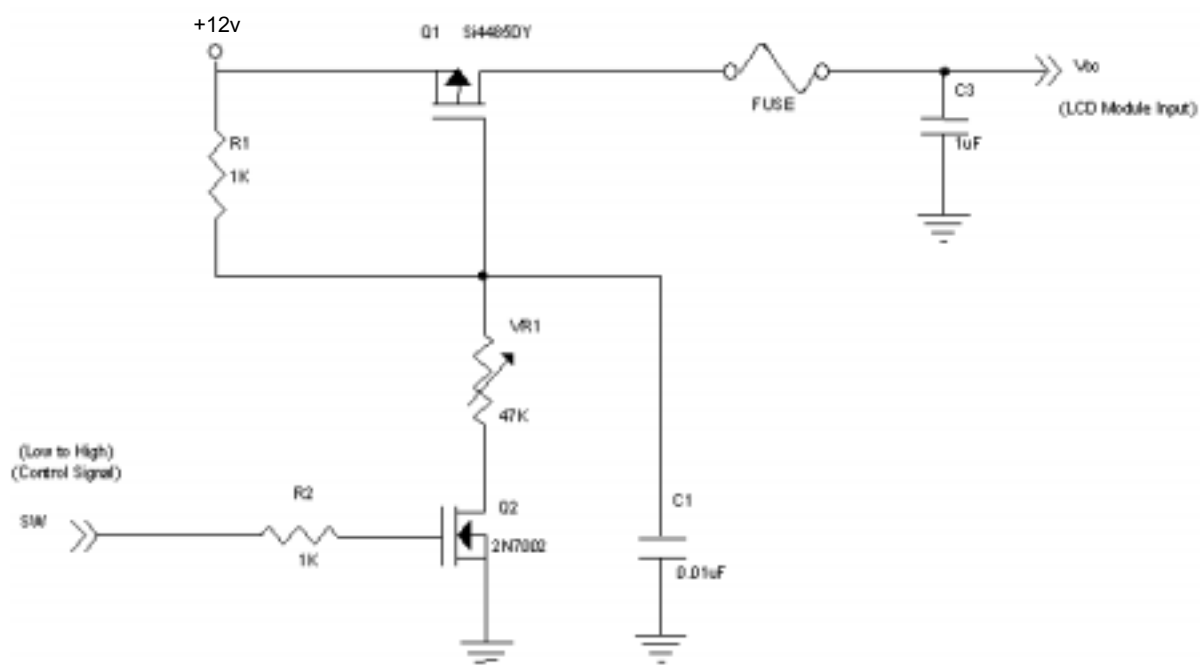
**Vcc rising time is 470us**

Vcc

0.9Vcc

0.1Vcc

GND

470us
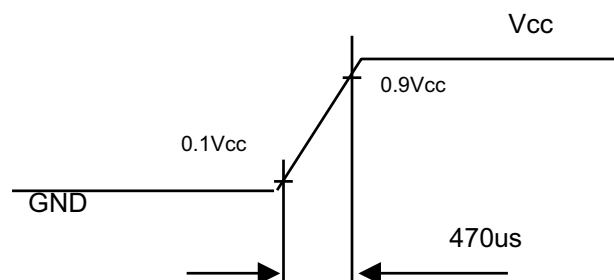
Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern
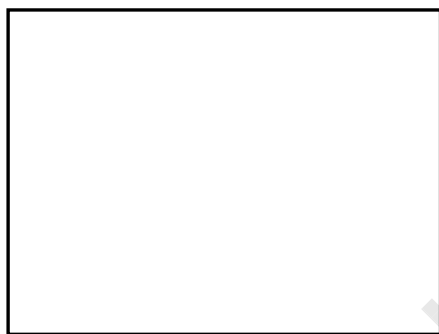
b. Black Pattern

Active Area
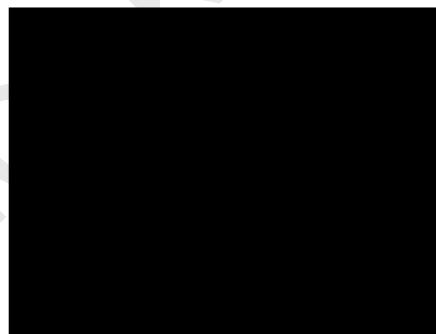
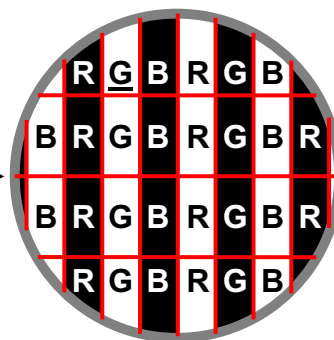Active Area

c. Vertical Stripe Pattern

| R | G | B | R | G | B |
| B | R | G | B | R | G | B | R |
| B | R | G | B | R | G | B | R |
| R | G | B | R | G | B |
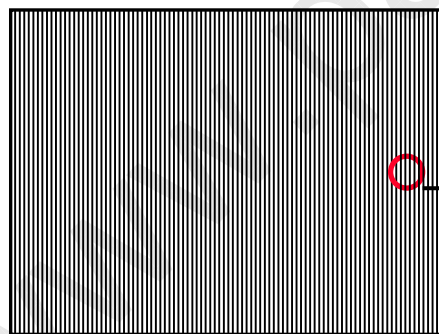
Active Area

## 3.2 BACKLIGHT UNIT

### 3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Lamp Input Voltage | $V_L$ | - | **1310** | - | $V_{RMS}$ | |
| Lamp Current | $I_L$ | **7.5** | **8** | **8.5** | $mA_{RMS}$ | (1) |
| Lamp Turn On Voltage | $V_S$ | - | - | **2230** | $V_{RMS}$ | Ta = 0 ºC (2) |
| | | - | - | **2060** | $V_{RMS}$ | Ta = 25 ºC (2) |
| Operating Frequency | $F_L$ | 35 | - | 70 | KHz | (3) |
| Lamp Life Time | $L_{BL}$ | 50,000 | 60,000 | - | Hrs | (4) |

### 3.2.2 INVERTER CHARACTERISTICS (Ta = 25 ± 2 ºC) (Recommend)

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Oscillating Frequency | $F_W$ | 39 | 42 | 45 | kHz | |
| Dimming frequency | $F_B$ | 150 | 160 | 170 | Hz | |
| Minimum Duty Ratio | $D_{MIN}$ | - | 20 | - | % | |

Note (1) Lamp current is measured by utilizing AC current probe and its value is average by measuring master and slave board.

Note (2) The lamp starting voltage $V_S$ should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) The life time of a lamp is defined as when the brightness is larger than 50% of its original value and the effective discharge length is longer than 80% of its original length (Effective discharge length is defined as an area that has equal to or more than 70% brightness compared to the brightness at the center point of lamp.) as the time in which it continues to operate under the condition at Ta = 25 ±2℃ and $I_L$ = **7.5~ 8.5**mArms.

**Version 2.0**

**Approval**



Inverter

HV (White +)
HV(Pink -)

HV (White +)
HV(Pink -)

HV (White +)
HV(Pink -)

HV (White +)
HV(Pink -)

HV (White +)
HV(Pink -)

HV (White +)
HV(Pink -)

HV (White +)
HV(Pink -)

HV (White +)
HV (Pink -)

LCD Module

11

**Version 2.0**

**Approval**
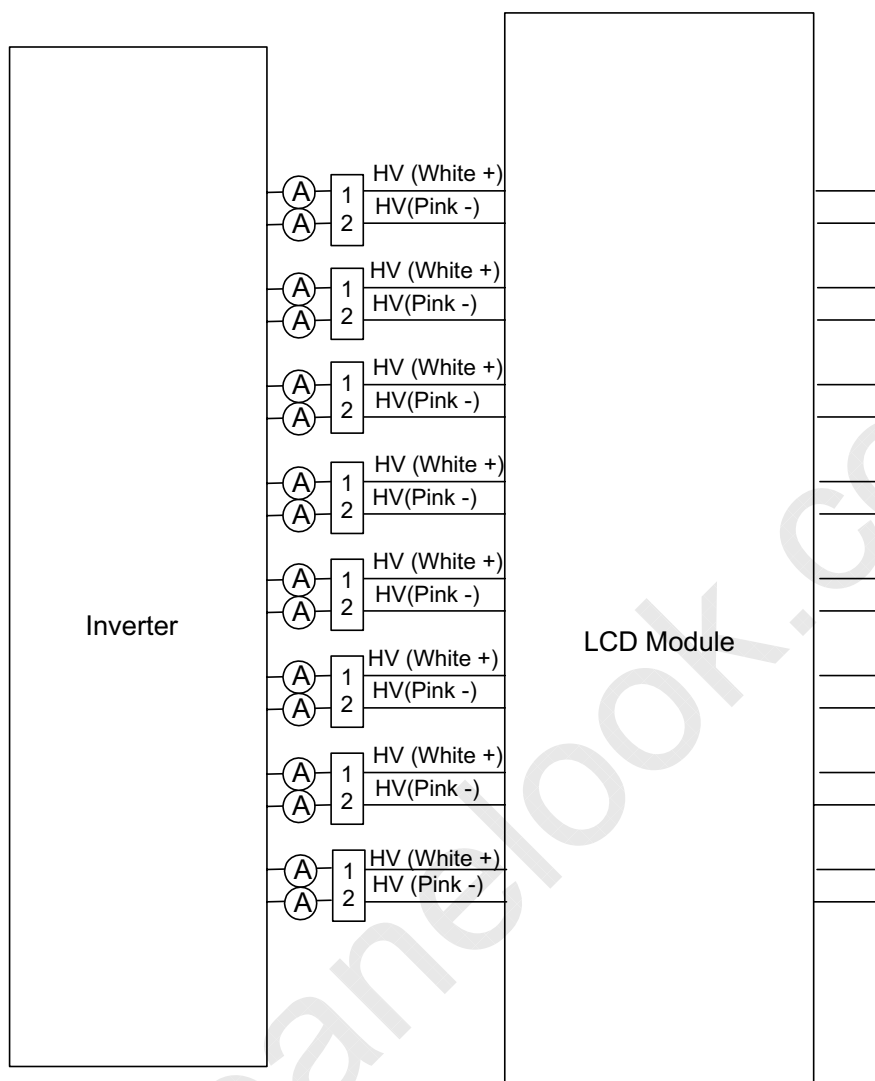
## 4. BLOCK DIAGRAM OF INTERFACE

### 4.1 TFT LCD MODULE

**Version 2.0**

Issue Date: Dec.31 2008
Model No.: V420H1-LN3
**Approval**
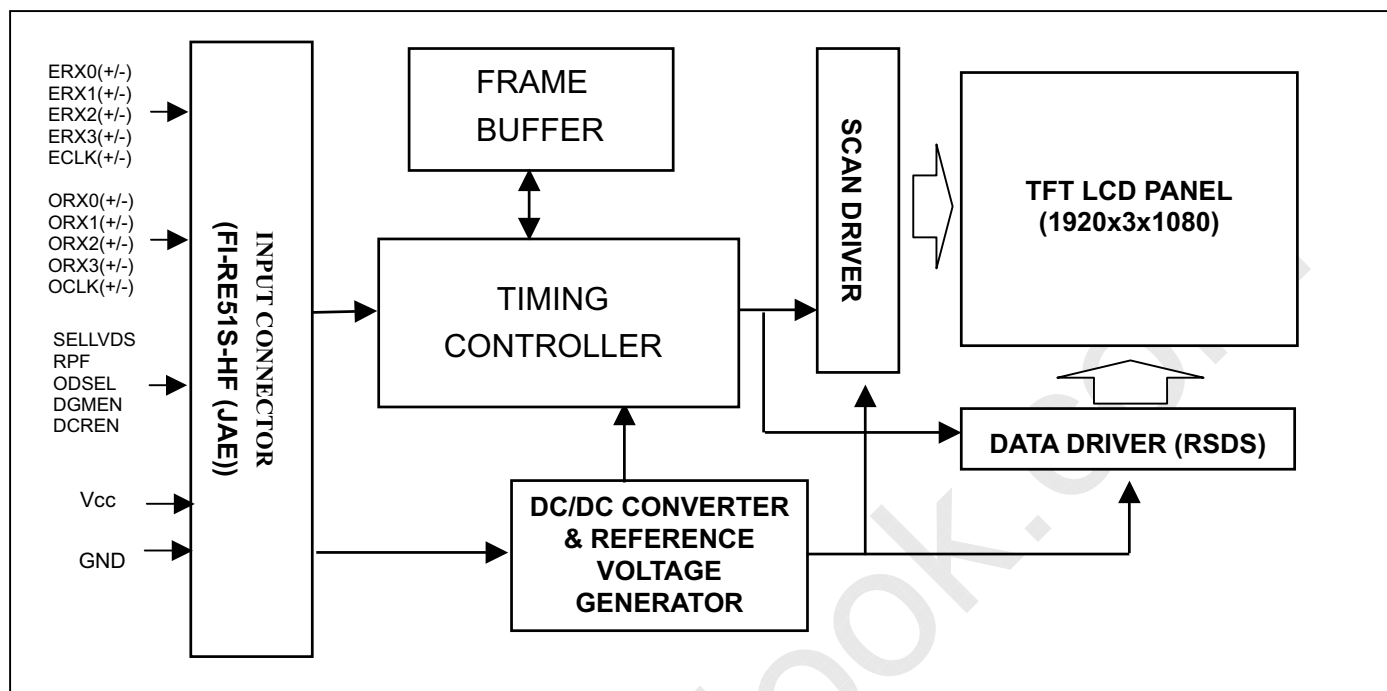
## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

**FI-RE51S-HF (JAE) or equivalent**

| Pin | Name | Description | Note |
|-----|------|-------------|------|
| 1 | N.C. | No Connection | (1) |
| 2 | N.C. | No Connection | |
| 3 | N.C. | No Connection | |
| 4 | N.C. | No Connection | |
| 5 | N.C. | No Connection | |
| 6 | N.C. | No Connection | |
| 7 | SELLVDS | LVDS data format Selection | (2) |
| 8 | RPF | Display Rotation | (3) |
| 9 | ODSEL | Overdrive Lookup Table Selection | (4) |
| 10 | DGMEN | Dynamic Gamma Enable | (5) |
| 11 | DCREN | Dynamic Contrast Ratio Enable | (6) |
| 12 | ORX0- | Odd pixel Negative LVDS differential data input. Channel 0 | |
| 13 | ORX0+ | Odd pixel Positive LVDS differential data input. Channel 0 | |
| 14 | ORX1- | Odd pixel Negative LVDS differential data input. Channel 1 | |
| 15 | ORX1+ | Odd pixel Positive LVDS differential data input. Channel 1 | |
| 16 | ORX2- | Odd pixel Negative LVDS differential data input. Channel 2 | |
| 17 | ORX2+ | Odd pixel Positive LVDS differential data input. Channel 2 | |
| 18 | GND | Ground | |
| 19 | OCLK- | Odd pixel Negative LVDS differential clock input. | |
| 20 | OCLK+ | Odd pixel Positive LVDS differential clock input. | |
| 21 | GND | Ground | |
| 22 | ORX3- | Odd pixel Negative LVDS differential data input. Channel 3 | |
| 23 | ORX3+ | Odd pixel Positive LVDS differential data input. Channel 3 | |
| 24 | N.C. | No Connection | |
| 25 | N.C. | No Connection | |
| 26 | N.C. | No Connection | |
| 27 | N.C. | No Connection | |
| 28 | ERX0- | Even pixel Negative LVDS differential data input. Channel 0 | |
| 29 | ERX0+ | Even pixel Positive LVDS differential data input. Channel 0 | |
| 30 | ERX1- | Even pixel Negative LVDS differential data input. Channel 1 | |
| 31 | ERX1+ | Even pixel Positive LVDS differential data input. Channel 1 | |
| 32 | ERX2- | Even pixel Negative LVDS differential data input. Channel 2 | |
| 33 | ERX2+ | Even pixel Positive LVDS differential data input. Channel 2 | |
| 34 | GND | Ground | |
| 35 | ECLK- | Even pixel Negative LVDS differential clock input. | |
| 36 | ECLK+ | Even pixel Positive LVDS differential clock input. | |
| 37 | GND | Ground | |
| 38 | ERX3- | Even pixel Negative LVDS differential data input. Channel 3 | |
| 39 | ERX3+ | Even pixel Positive LVDS differential data input. Channel 3 | |
| 40 | N.C. | No Connection | (1) |
| 41 | N.C. | No Connection | |
| 42 | N.C. | No Connection | |
| 43 | N.C. | No Connection | |
| 44 | GND | Ground | |
| 45 | GND | Ground | |
| 46 | GND | Ground | |

13

**Version 2.0**

| 47 | GND | Ground | |
| 48 | VCC | +12V power supply | |
| 49 | VCC | +12V power supply | |
| 50 | VCC | +12V power supply | |
| 51 | VCC | +12V power supply | |

Note (1) Reserved for internal use. Please leave it open.

Note (2) Low: VESA LVDS Format (default), High: JEIDA Format.

Note (3) Low: normal display (default), High: display with 180 degree rotation

Note (4) Overdrive lookup table selection. The overdrive lookup table should be selected in accordance with the

frame rate to optimize image quality.

| ODSEL | Note |
| --- | --- |
| L | Lookup table was optimized for 60 Hz frame rate. |
| H | Lookup table was optimized for 50 Hz frame rate. |

Note (5) Low: function disable (default), High: Dynamic Gamma function enable.

Note (6) Low: function disable (default), High: Dynamic Contrast Ratio function enable.

Note (7) Low: Open or Connect to GND, High: Connect to +3.3V

**Version 2.0**

## 5.2 BACKLIGHT UNIT

The pin configuration for the housing and the leader wire is shown in the table below.

CN3-CN10: BHR-04VS-1 (JST).

| Pin | Name | Description | Wire Color |
|---|---|---|---|
| 1 | HV | High Voltage | White |
| 2 | HV | High Voltage | Pink |

Note (1) The backlight interface housing for high voltage side is a model BHR-04VS-1, manufactured by JST.

The mating header on inverter part number is SM02(12.0)B-BHS-1-TB(LF).

## 5.3 BLOCK DIAGRAM OF INTERFACE



LVDS Transmitter
THC63LVDM83A
(LVDF83A)

LVDS Receiver
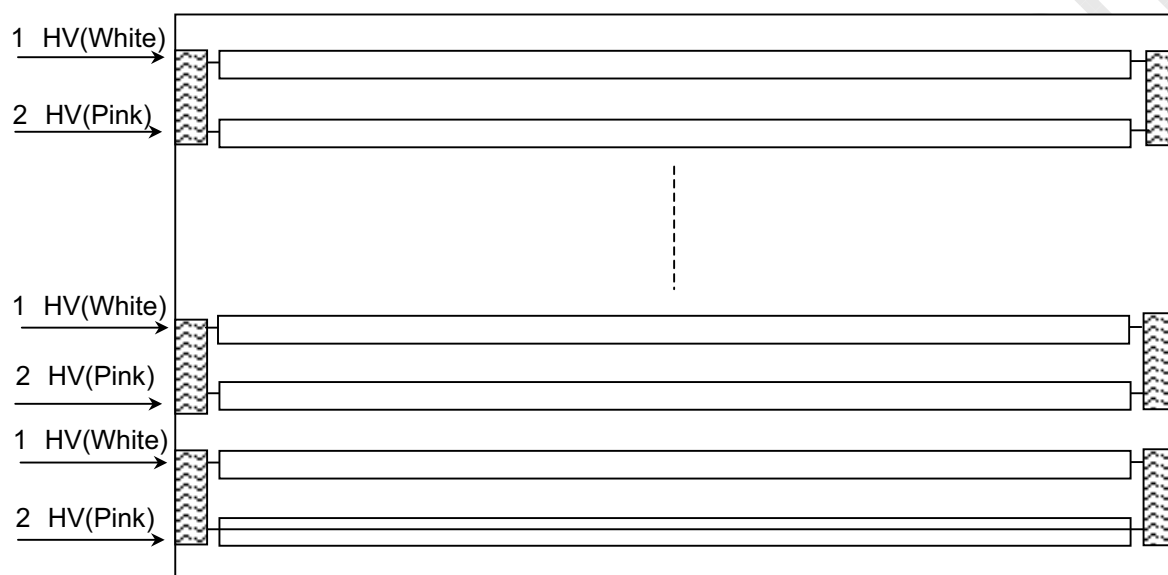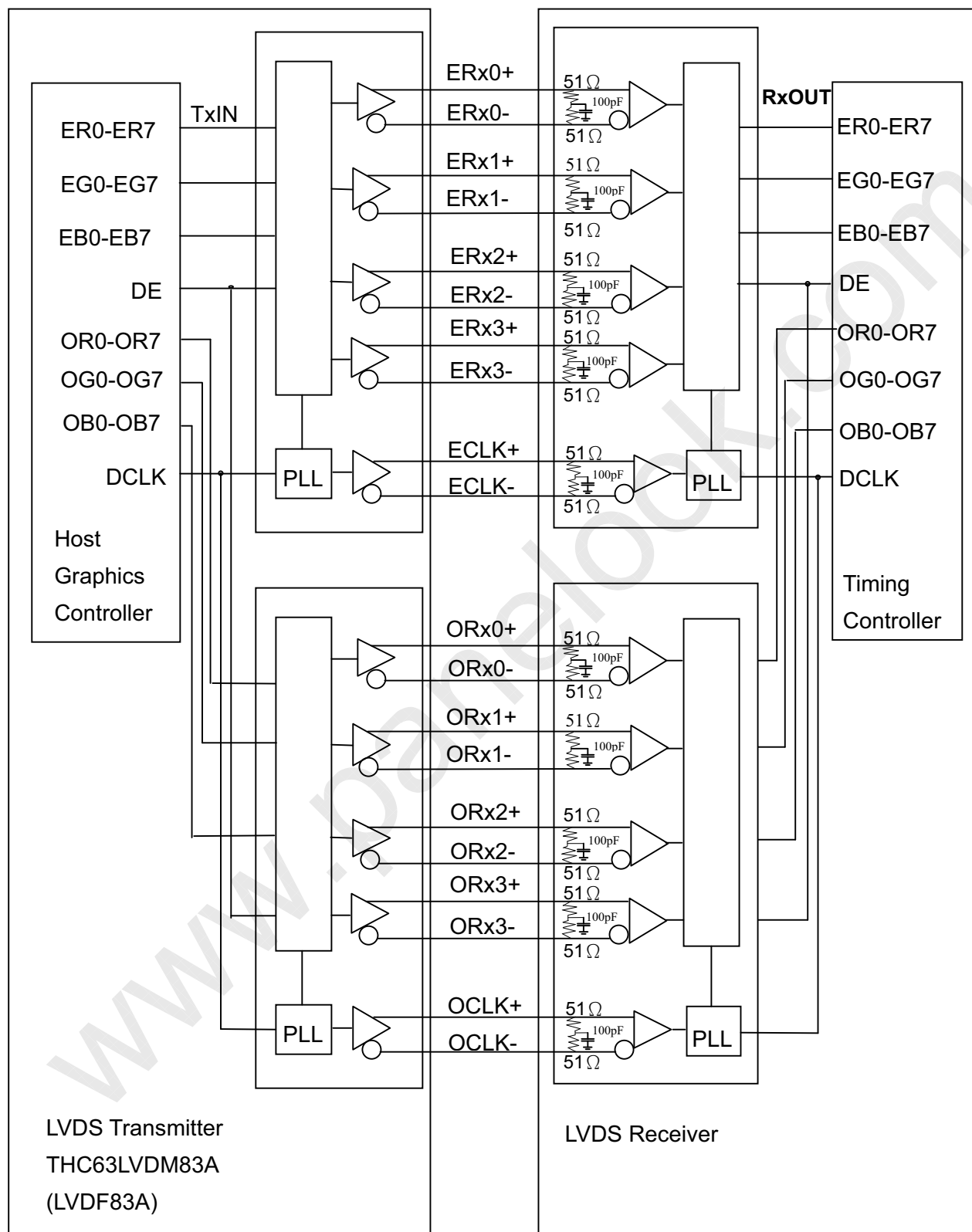
ER0~ER7 : Even pixel R data

EG0~EG7 : Even pixel G data

EB0~EB7 : Even pixel B data

OR0~OR7 : Odd pixel R data

OG0~OG7: Odd pixel G data

OB0~OB7 : Odd pixel B data

DE           : Data enable signal

DCLK       : Data clock signal


Notes:      (1) The system must have the transmitter to drive the module.

(2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

(3) Two pixel data send into the module for every clock cycle. The first pixel of the frame is even pixel and the second pixel is odd pixel.

**Version 2.0**

Issue Date: Dec.31 2008
Model No.: V420H1-LN3
**Approval**

## 5.4 LVDS INTERFACE

| | SIGNAL | | TRANSMITTER THC63LVDM83A | | INTERFACE CONNECTOR | | RECEIVER THC63LVDF84A | | TFT CONTROL INPUT | |
|---|---|---|---|---|---|---|---|---|---|---|
| | LVDS_SEL =L or OPEN | LVDS_SEL = H | PIN | INPUT | Host | TFT-LCD | PIN | OUTPUT | LVDS_SEL =L or OPEN | LVDS_SEL = H |
| 24 bit | R0 | R2 | 51 | TxIN0 | | | 27 | Rx OUT0 | R0 | R2 |
| | R1 | R3 | 52 | TxIN1 | | | 29 | Rx OUT1 | R1 | R3 |
| | R2 | R4 | 54 | TxIN2 | TA OUT0+ | Rx 0+ | 30 | Rx OUT2 | R2 | R4 |
| | R3 | R5 | 55 | TxIN3 | | | 32 | Rx OUT3 | R3 | R5 |
| | R4 | R6 | 56 | TxIN4 | | | 33 | Rx OUT4 | R4 | R6 |
| | R5 | R7 | 3 | TxIN6 | TA OUT0- | Rx 0- | 35 | Rx OUT6 | R5 | R7 |
| | G0 | G2 | 4 | TxIN7 | | | 37 | Rx OUT7 | G0 | G2 |
| | G1 | G3 | 6 | TxIN8 | | | 38 | Rx OUT8 | G1 | G3 |
| | G2 | G4 | 7 | TxIN9 | | | 39 | Rx OUT9 | G2 | G4 |
| | G3 | G5 | 11 | TxIN12 | TA OUT1+ | Rx 1+ | 43 | Rx OUT12 | G3 | G5 |
| | G4 | G6 | 12 | TxIN13 | | | 45 | Rx OUT13 | G4 | G6 |
| | G5 | G7 | 14 | TxIN14 | | | 46 | Rx OUT14 | G5 | G7 |
| | B0 | B2 | 15 | TxIN15 | TA OUT1- | Rx 1- | 47 | Rx OUT15 | B0 | B2 |
| | B1 | B3 | 19 | TxIN18 | | | 51 | Rx OUT18 | B1 | B3 |
| | B2 | B4 | 20 | TxIN19 | | | 53 | Rx OUT19 | B2 | B4 |
| | B3 | B5 | 22 | TxIN20 | | | 54 | Rx OUT20 | B3 | B5 |
| | B4 | B6 | 23 | TxIN21 | TA OUT2+ | Rx 2+ | 55 | Rx OUT21 | B4 | B6 |
| | B5 | B7 | 24 | TxIN22 | | | 1 | Rx OUT22 | B5 | B7 |
| | DE | DE | 30 | TxIN26 | | | 6 | Rx OUT26 | DE | DE |
| | R6 | R0 | 50 | TxIN27 | TA OUT2- | Rx 2- | 7 | Rx OUT27 | R6 | R0 |
| | R7 | R1 | 2 | TxIN5 | | | 34 | Rx OUT5 | R7 | R1 |
| | G6 | G0 | 8 | TxIN10 | | | 41 | Rx OUT10 | G6 | G0 |
| | G7 | G1 | 10 | TxIN11 | | | 42 | Rx OUT11 | G7 | G1 |
| | B6 | B0 | 16 | TxIN16 | TA OUT3+ | Rx 3+ | 49 | Rx OUT16 | B6 | B0 |
| | B7 | B1 | 18 | TxIN17 | | | 50 | Rx OUT17 | B7 | B1 |
| | RSVD 1 | RSVD 1 | 25 | TxIN23 | | | 2 | Rx OUT23 | NC | NC |
| | RSVD 2 | RSVD 2 | 27 | TxIN24 | TA OUT3- | Rx 3- | 3 | Rx OUT24 | NC | NC |
| | RSVD 3 | RSVD 3 | 28 | TxIN25 | | | 5 | Rx OUT25 | NC | NC |
| | DCLK | | 31 | TxCLK IN | TxCLK OUT+ TxCLK OUT- | RxCLK IN+ RxCLK IN- | 26 | RxCLK OUT | DCLK | |

R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE  : Data enable signal

DCLK : Data clock signal

Notes: (1) RSVD (reserved) pins on the transmitter shall be "H" or "L".

18

**Version 2.0**

Issue Date: Dec.31 2008
Model No.: V420H1-LN3
**Approval**

## 5.5 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red (0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red (253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red (255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green (0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green (253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green (255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue (0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue (1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue (2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue (253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue (254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue (255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1)      0: Low Level Voltage, 1: High Level Voltage

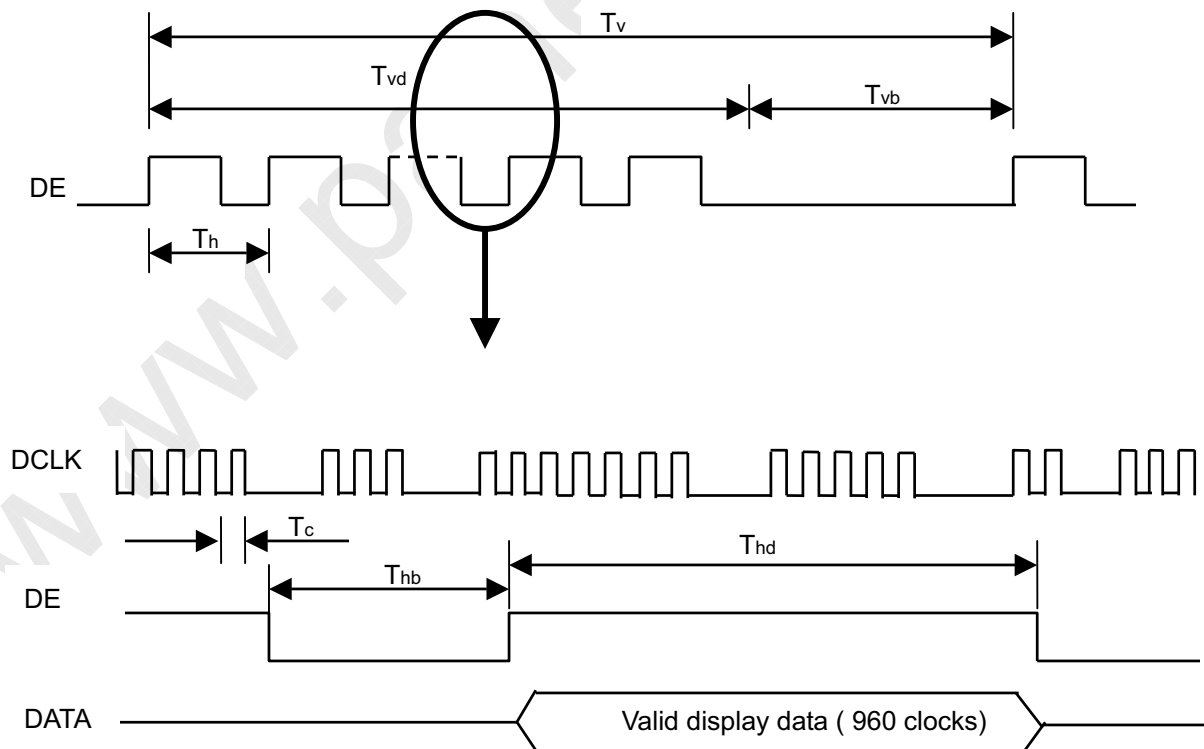## 6. INTERFACE TIMING

### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Receiver Clock | Frequency | 1/Tc | 60 | 74 | 80 | MHz | - |
| | Input cycle to cycle jitter | Trcl | - | - | 200 | ps | - |
| LVDS Receiver Data | Setup Time | Tlvsu | 600 | - | - | ps | - |
| | Hold Time | Tlvhd | 600 | - | - | ps | - |
| Vertical Active Display Term | Frame Rate | Fr5 | 47 | 50 | 53 | Hz | (1) |
| | | Fr6 | 57 | 60 | 63 | Hz | (1) |
| | Total | Tv | 1115 | 1125 | 1135 | Th | Tv=Tvd+Tvb |
| | Display | Tvd | 1080 | 1080 | 1080 | Th | - |
| | Blank | Tvb | 35 | 45 | 55 | Th | - |
| Horizontal Active Display Term | Total | Th | 1050 | 1100 | 1150 | Tc | Th=Thd+Thb |
| | Display | Thd | 960 | 960 | 960 | Tc | - |
| | Blank | Thb | 90 | 140 | 190 | Tc | - |

Note (1) (ODSEL) = (H) , (L). Please refer to 5.1 for detail information.

Note (2) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low

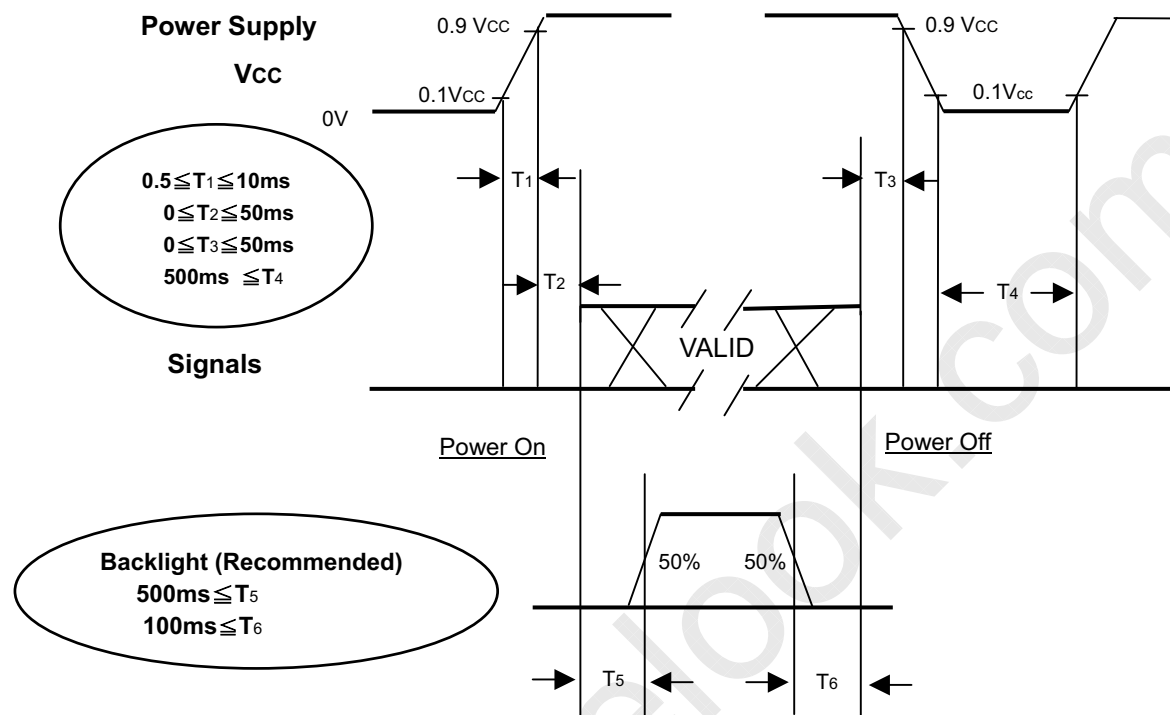logic level. Otherwise, this module would operate abnormally.

## INPUT SIGNAL TIMING DIAGRAM

**Version 2.0**

## LVDS INPUT INTERFACE TIMING DIAGRAM

Issue Date: Dec.31 2008
Model No.: V420H1-LN3
**Approval**
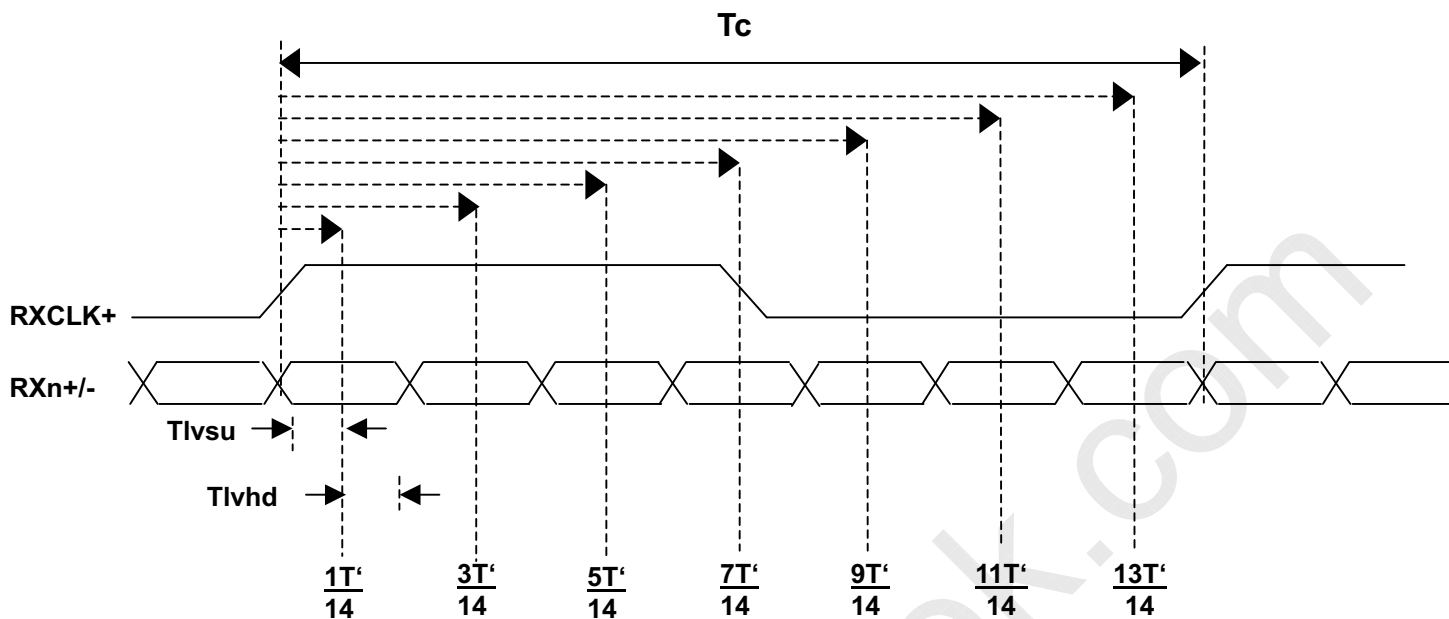
### 6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the diagram below.



**Power ON/OFF Sequence**

Note.

(1) The supply voltage of the external system for the module input should follow the definition of Vcc.

(2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

(3) In case of VCC is in off level, please keep the level of input signals on the low or high impedance.

(4) T4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

22

**Version 2.0**

Issue Date: Dec.31 2008
Model No.: V420H1-LN3
**Approval**

# 7. OPTICAL CHARACTERISTICS

## 7.1 TEST CONDITIONS

| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | $25\pm2$ | $^{o}$C |
| Ambient Humidity | Ha | $50\pm10$ | %RH |
| Supply Voltage | $V_{CC}$ | 12 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| Lamp Current | $I_L$ | **8±0.5** | mA |
| Oscillating Frequency (Inverter) | $F_W$ | $42\pm3$ | KHz |
| Vertical Frame Rate | Fr | 60 | Hz |

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.
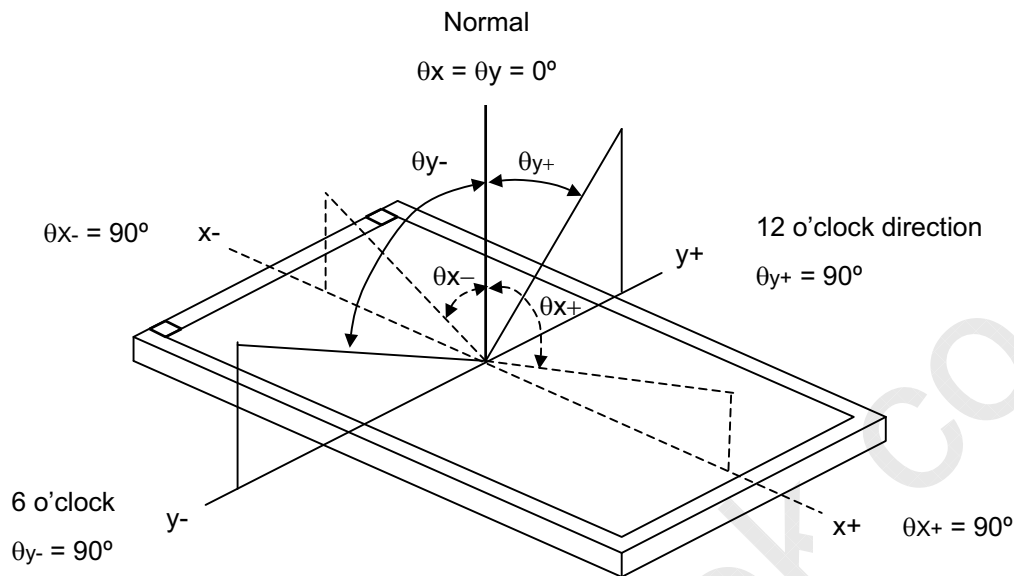
## 7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | $\theta_x=0°$, $\theta_Y=0°$ Viewing angle at normal direction. | 3000 | 4000 | - | | Note (2) |
| Response Time | | Gray to gray | | - | 6.5 | 12 | ms | Note (3) |
| Center Luminance of White | | $L_C$ | | 380 | 450 | | cd/m$^2$ | Note (4) |
| White Variation | | $\delta$W | | - | - | 1.3 | - | Note (7) |
| Cross Talk | | CT | | - | - | 4 | % | Note (5) |
| Color Chromaticity | Red | Rx | | Typ. -0.03 | 0.637 | Typ. +0.03 | - | Note (6) |
| | | Ry | | | 0.332 | | - | |
| | Green | Gx | | | 0.268 | | - | |
| | | Gy | | | 0.601 | | - | |
| | Blue | Bx | | | 0.152 | | - | |
| | | By | | | 0.060 | | - | |
| | White | Wx | | | 0.280 | | - | |
| | | Wy | | | 0.285 | | - | |
| | Color Gamut | C.G | | 68 | 72 | - | % | NTSC |
| Viewing Angle | Horizontal | $\theta_x+$ | CR≥20 | 80 | 88 | - | Deg. | Note (1) |
| | | $\theta_x-$ | | 80 | 88 | - | | |
| | Vertical | $\theta_Y+$ | | 80 | 88 | - | | |
| | | $\theta_Y-$ | | 80 | 88 | - | | |

**Version 2.0**

**Approval**

Note (1)　　Definition of Viewing Angle ($\theta x$, $\theta y$):

Viewing angles are measured by Eldim EZ-Contrast 160R

Normal

$\theta x = \theta y = 0^\circ$

$\theta y-$　　$\theta y+$

$\theta x- = 90^\circ$　　x-

12 o'clock direction

$\theta y+ = 90^\circ$

y+

$\theta x-$　　$\theta x+$

6 o'clock

y-

x+　　$\theta x+ = 90^\circ$

$\theta y- = 90^\circ$

Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance with all white pixels}}{\text{Sruface Luminance with all black pixels}}$$

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3) Definition of Gray to Gray Switching Time :

100%
90%

Optical

Response

10%
0%

Time

Gray to gray switching time

Gray to gray switching time
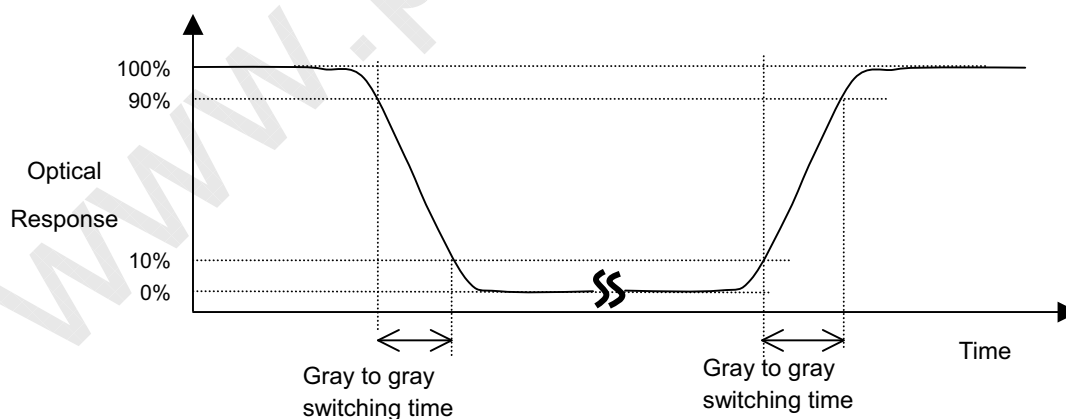
The driving signal means the signal of luminance 0%, 20%, 40%, 60%, 80%, 100%.

Gray to gray average time means the average switching time of luminance 0%, 20%, 40%, 60%, 80%, 100% to each other.

**Version 2.0**

Note (4) Definition of Luminance of White ($L_C$, $L_{AVE}$):

Measure the luminance of gray level 255 at center point and 5 points

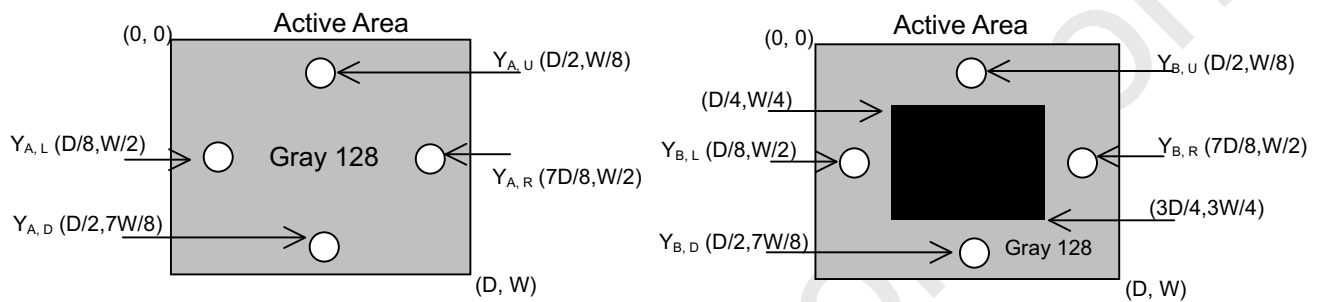$L_C$ = L (5), where L (X) is corresponding to the luminance of the point X at the figure in Note (7).

Note (5) Definition of Cross Talk (CT):

CT = | $Y_B$ – $Y_A$ | / $Y_A \times$ 100 (%)

Where:

$Y_A$ = Luminance of measured location without gray level 0 pattern (cd/m$^2$)

$Y_B$ = Luminance of measured location with gray level 0 pattern (cd/m$^2$)



Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.

Version 2.0
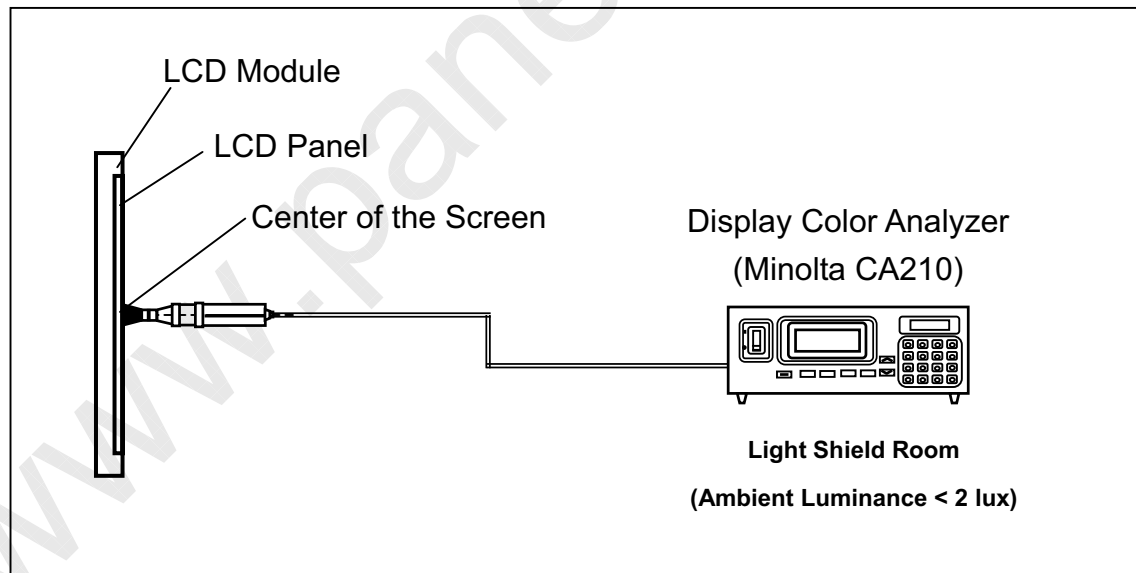
Note (7) Definition of White Variation ($\delta$W):

Measure the luminance of gray level 255 at 5 points

$\delta$W = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Horizontal Line



Active Area

**Version 2.0**
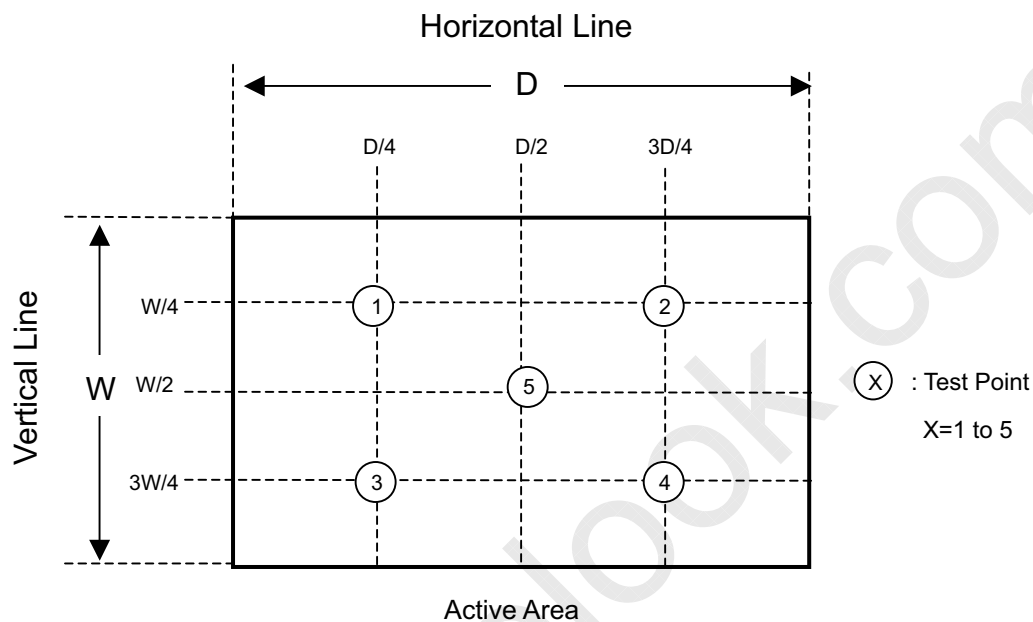
# 8. PRECAUTIONS

## 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) When storing modules as spares for a long time, the following precaution is necessary.

(a)Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃ at normal humidity without condensation.

(b)The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.
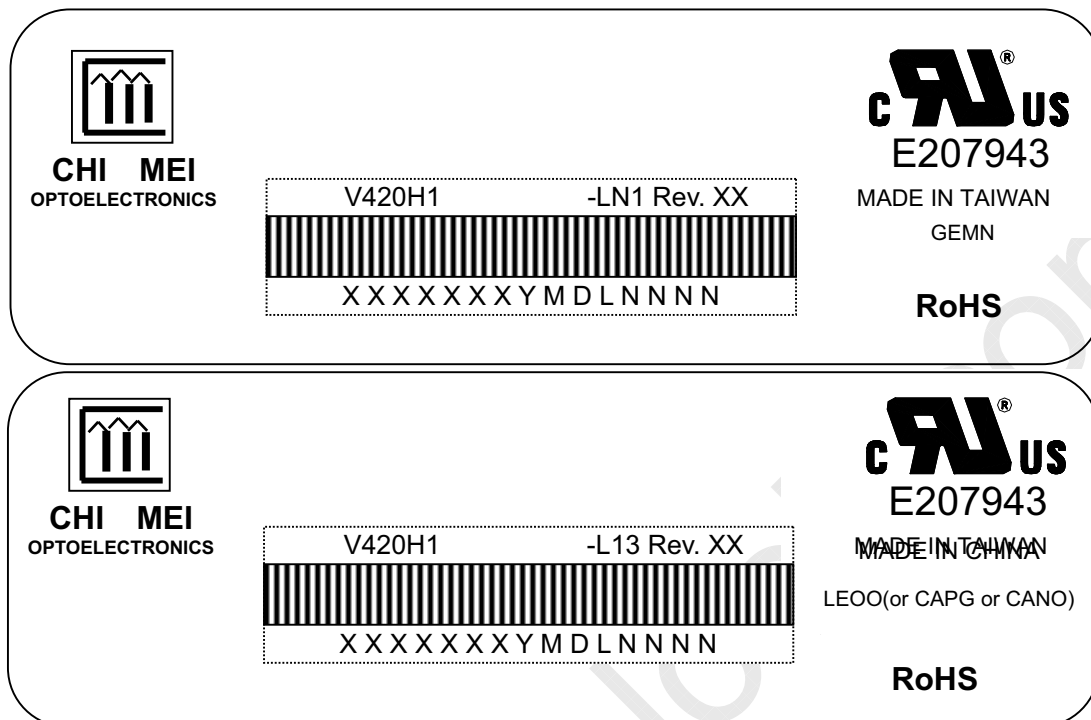
## 8.2 SAFETY PRECAUTIONS

(1) The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

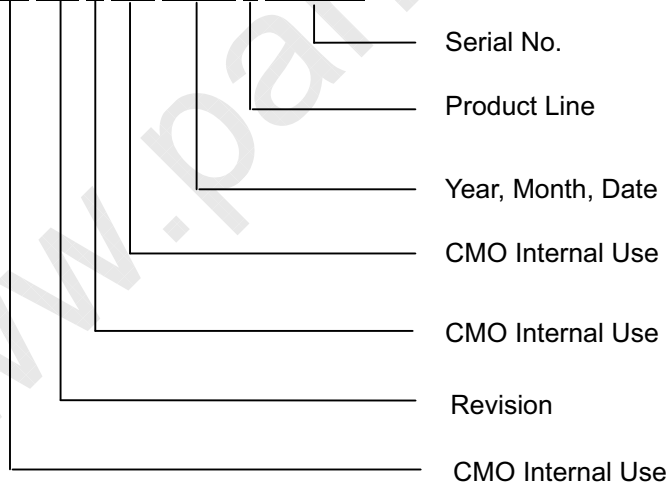(3) After the module's end of life, it is not harmful in case of normal operation and storage.

# 9. DEFINITION OF LABELS

## 9.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



CHI MEI
OPTOELECTRONICS

V420H1          -LN1 Rev. XX

X X X X X X X Y M D L N N N N

E207943
MADE IN TAIWAN
GEMN
**RoHS**

CHI MEI
OPTOELECTRONICS

V420H1          -L13 Rev. XX

X X X X X X X Y M D L N N N N

E207943
MADE IN CHINA
LEOO(or CAPG or CANO)
**RoHS**

(a)  Model Name: V420H1-LN1

(b)  Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c)  Serial ID: X X X X X X X Y M D L N N N N

Serial No.

Product Line

Year, Month, Date

CMO Internal Use

CMO Internal Use

Revision

CMO Internal Use

Serial ID includes the information as below:

(a)  Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

(b)  Revision Code: Cover all the change

(c)  Serial No.: Manufacturing sequence of product

(d)  Product Line: 1 -> Line1, 2 -> Line 2, …etc.

Version 2.0

## 10. PACKAGING

### 10.1 PACKING SPECIFICATIONS

(1) 4 LCD TV modules / 1 Box

(2) Box dimensions : 1100(L)x317(W)x670(H)mm

(3) Weight : Approx. 53.17Kg(4 modules per carton)

### 10.2 PACKING METHOD
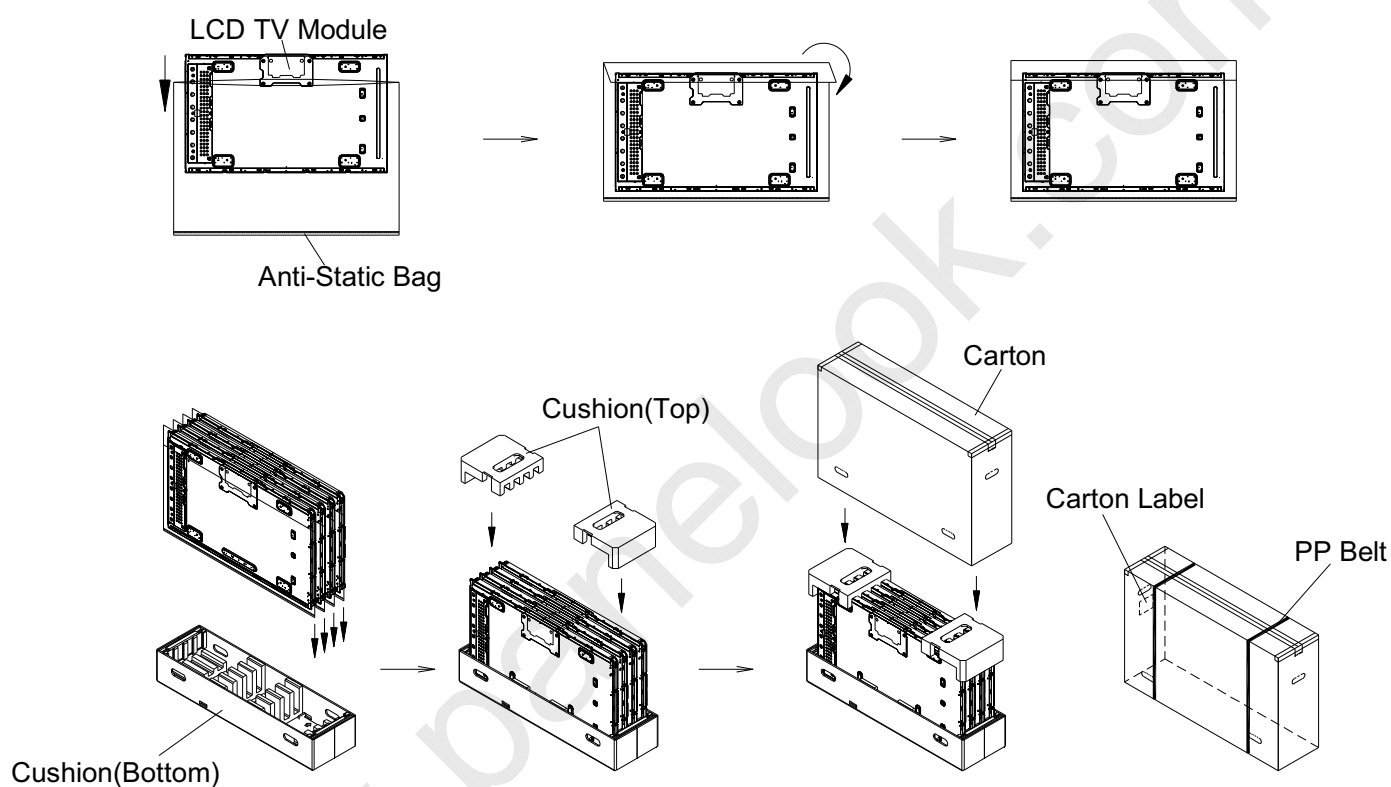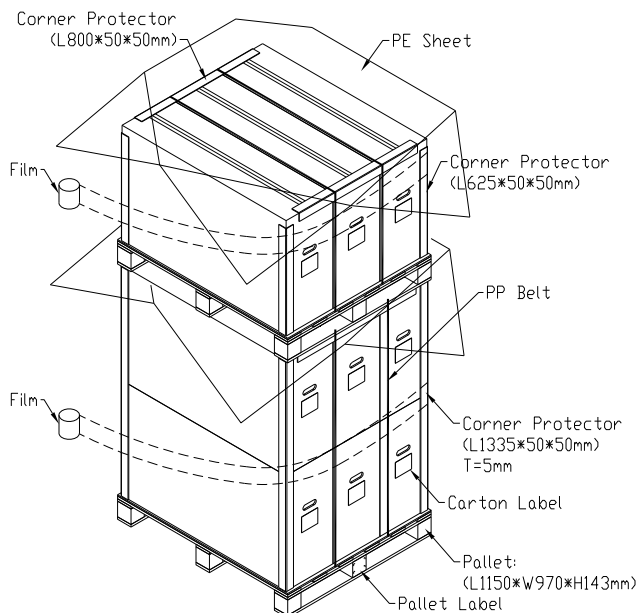
Figures 10-1 and 10-2 are the packing method



Figure.10-1 packing method

29

Sea / Land Transportation
(40ft HQ Container)

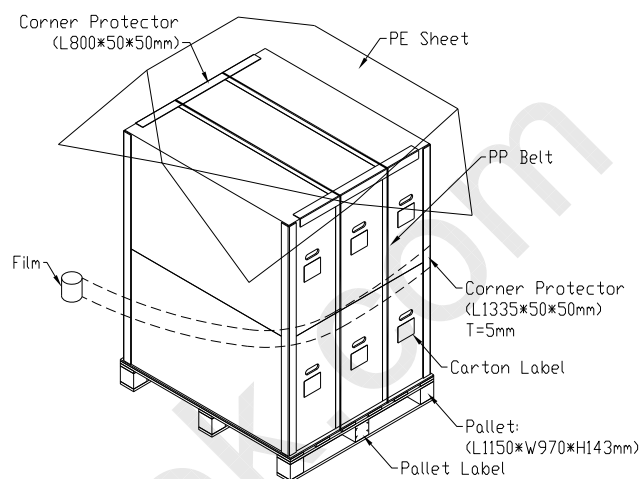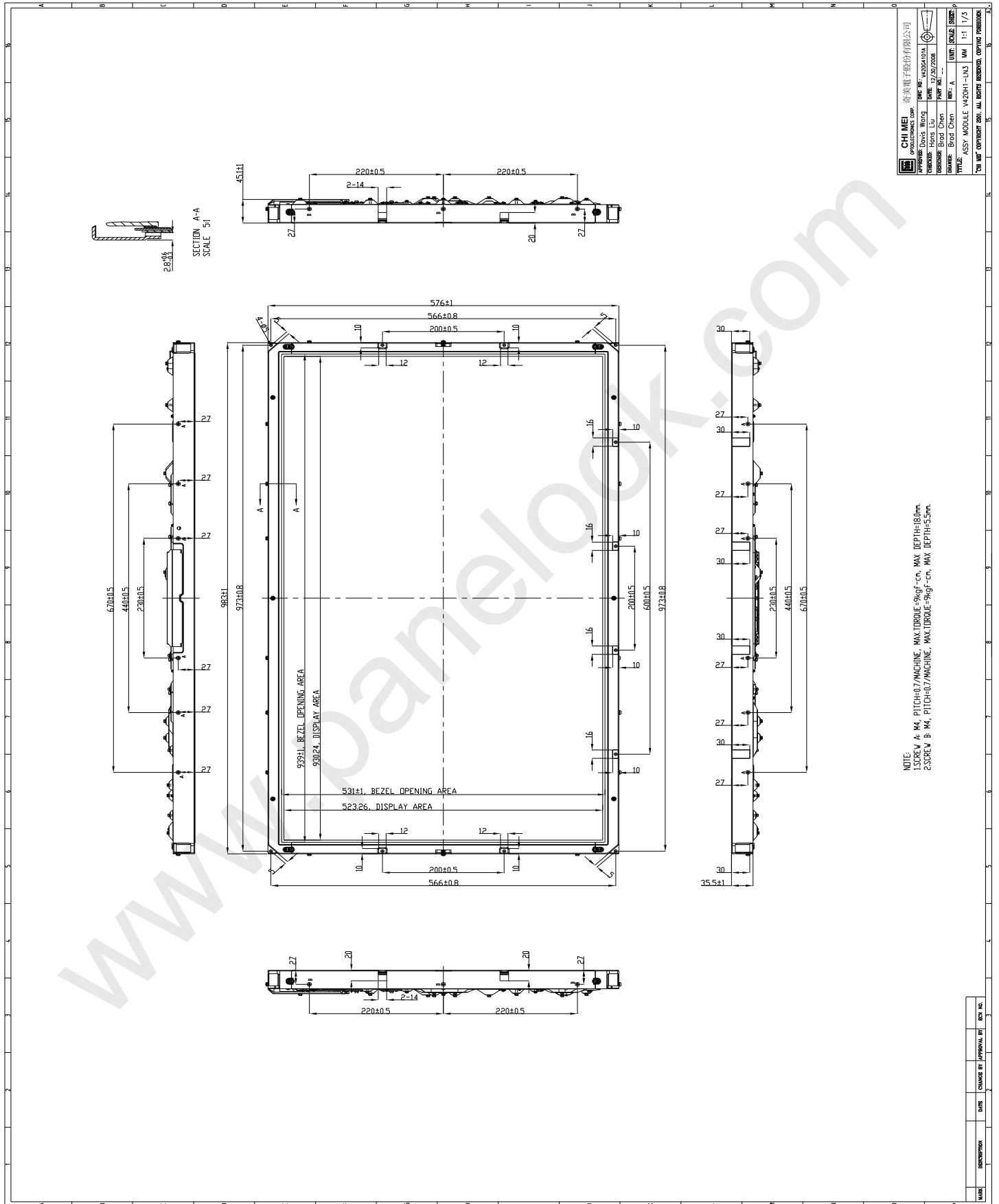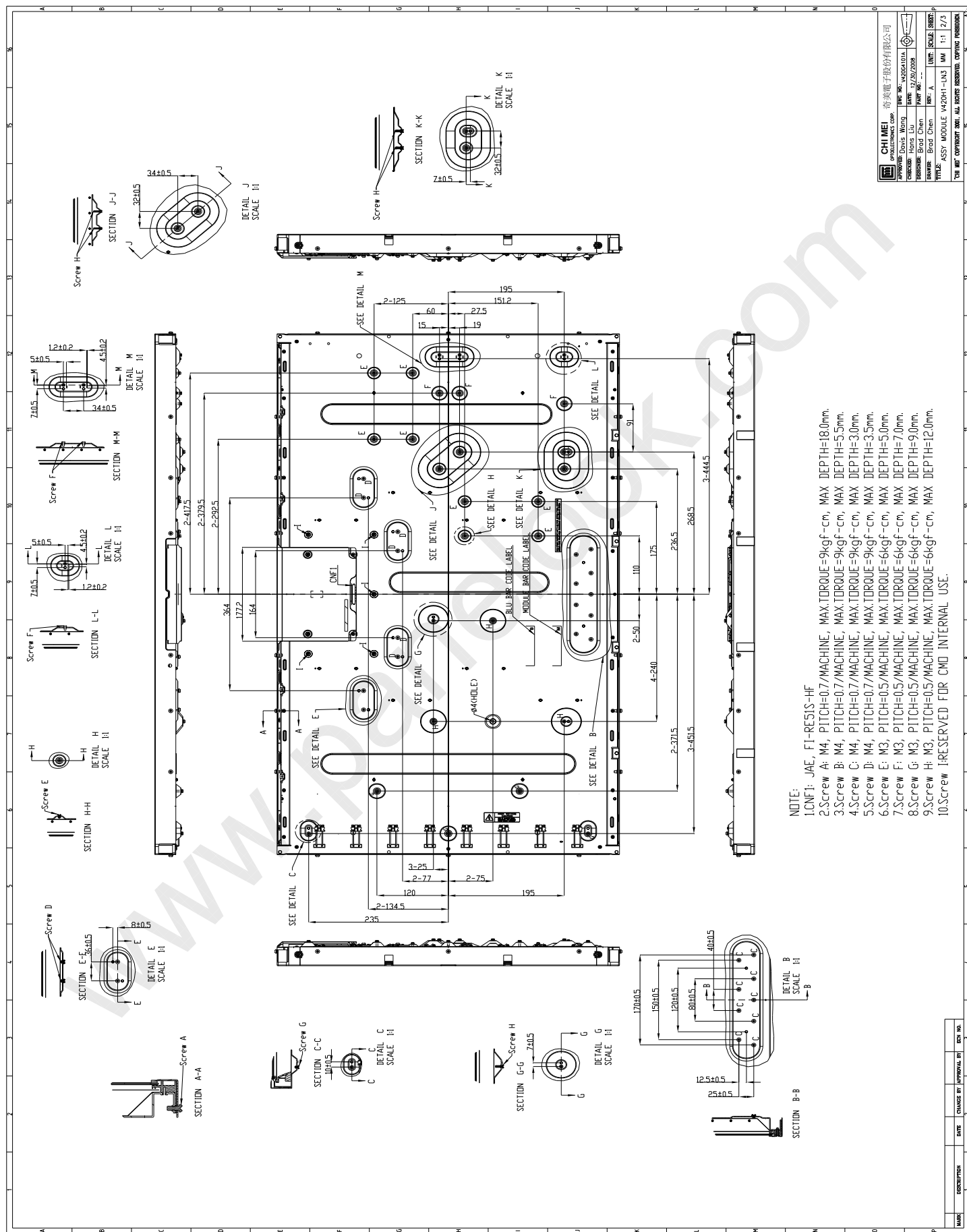Air Transportation
&
Sea / Land Transportation
(40ft Container)



Figure.10-2 packing method

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Model No.: V420H1-LN3
**Approval**

## 11. MECHANICAL CHARACTERISTICS

**Version 2.0**

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NOTE:
1. CNF1: JAE, FI-RE51S-HF
2. Screw A: M4, PITCH=0.7/MACHINE, MAX.TORQUE=9kgf-cm, MAX DEPTH=18.0mm.
3. Screw B: M4, PITCH=0.7/MACHINE, MAX.TORQUE=9kgf-cm, MAX DEPTH=5.5mm.
4. Screw C: M4, PITCH=0.7/MACHINE, MAX.TORQUE=9kgf-cm, MAX DEPTH=3.0mm.
5. Screw D: M4, PITCH=0.7/MACHINE, MAX.TORQUE=9kgf-cm, MAX DEPTH=3.5mm.
6. Screw E: M3, PITCH=0.5/MACHINE, MAX.TORQUE=6kgf-cm, MAX DEPTH=5.0mm.
7. Screw F: M3, PITCH=0.5/MACHINE, MAX.TORQUE=6kgf-cm, MAX DEPTH=7.0mm.
8. Screw G: M3, PITCH=0.5/MACHINE, MAX.TORQUE=6kgf-cm, MAX DEPTH=9.0mm.
9. Screw H: M3, PITCH=0.5/MACHINE, MAX.TORQUE=6kgf-cm, MAX DEPTH=12.0mm.
10. Screw I: RESERVED FOR CMO INTERNAL USE.

CHI MEI
OPTOELECTRONICS CORP.    奇美電子股份有限公司
APPROVED: Davis Wong
CHECKED: Hans Liu
DESIGNER: Brad Chen
DRAWER: Brad Chen
TITLE:
ASSY MODULE V420H1-LN3
DWG NO.: V420G4101A
DATE: 12/30/2008
PART NO.: --
REV.: A
UNIT: MM  SCALE: 1:1  SHEET: 2/3
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Version 2.0

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Note:
1.It is recommended that all screws should be included when CMO's product is applied in order to guarantee structure strength of product.
2.Screw:M4(Pitch:0.7/Machine)
3.Max.Torque:9 kgf-cm.

奇美電子股份有限公司

| | |
|---|---|
| DWG NO.: V420G4101A | |
| APPROVED: Davis Wong | DATE: 12/30/2008 |
| CHECKED: Hans Liu | PART NO.: |
| DESIGNER: Brad Chen | |
| DRAWER: Brad Chen | REV.: A |
| TITLE: ASSY MODULE V420H1-LN3 | UNIT: MM | SCALE: 1:1 | SHEET: 3/3 |

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**33**

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