

## TFT LCD Approval Specification

# MODEL NO.: V420H1 - L04

Customer: \_\_\_\_\_

Approval by: \_\_\_\_\_

Note: \_\_\_\_\_

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## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

V420H1-L04 is a 42" TFT Liquid Crystal Display module with 20-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).

The inverter module for backlight is built-in.

### 1.2 FEATURES

- High brightness (500 nits)
- High contrast ratio (1200:1)
- Fast response time (Gray to gray average 6.5ms)
- High color saturation (NTSC 75%)
- 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 50/60 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

x	Specification	Unit	Note
Active Area	930.24(H) x 523.26 (V) (42.02" diagonal)	mm	(1)
Bezel Opening Area	938.3 (H) x 531.3 (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)	982.3	983.0	984.0	mm	(1), (2)
	Vertical (V)	575.3	576.0	577.0	mm	
	Depth (D)	51.3	52.3	53.3	mm	
	Weight	13100	13300	13500	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.

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T <sub>ST</sub>	-20	+60	°C	(1)
Operating Ambient Temperature	T <sub>OP</sub>	0	50	°C	(1), (2)
Shock (Non-Operating)	S <sub>NOF</sub>	-	(50)	G	(3), (5)
Vibration (Non-Operating)	V <sub>NOF</sub>	-	1.0	G	(4), (5)

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

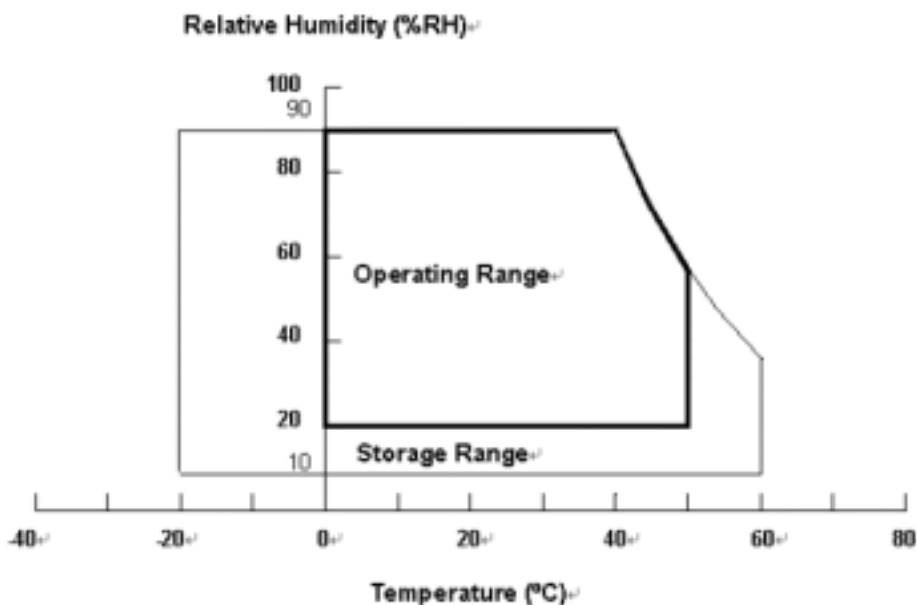
- (a) 90 %RH Max. (Ta = 40 °C).
- (b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).
- (c) No condensation.
- (d) 40 °C/95 % RH is for reference.

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 °C 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 °C. 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.



## 2.2 Storage

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.

## 2.3 ELECTRICAL ABSOLUTE RATINGS

### 2.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	$V_{CC}$	-0.3	20	V	(1)
Logic Input Voltage	$V_{IN}$	-0.3	3.6	V	

### 2.3.2 BACKLIGHT INVERTER UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	$V_W$	-	3000	$V_{RMS}$	
Power Supply Voltage	$V_{BL}$	0	30	V	(1)
Control Signal Level	-	-0.3	7	V	(1), (3)

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.

Note (3) The control signals include On/Off Control, Internal PWM Control, External PWM Control and Internal/External PWM Selection.

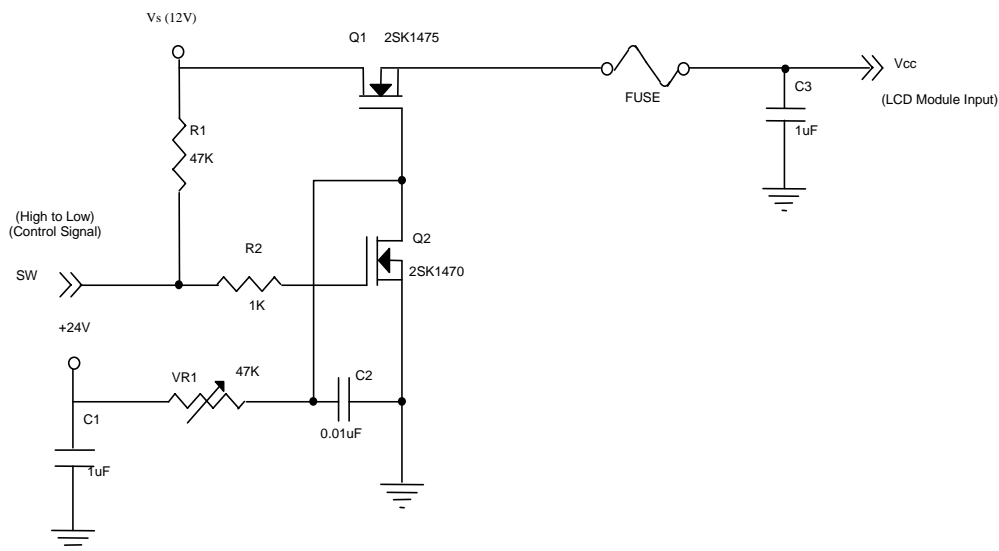
### 3. ELECTRICAL CHARACTERISTICS

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

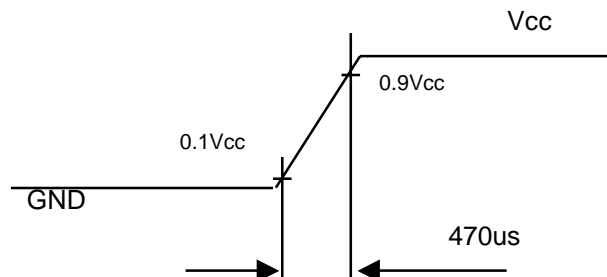
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V <sub>CC</sub>	10.8	12	13.2	V	(1)
Power Supply Ripple Voltage	V <sub>RP</sub>	-	-	350	mV	
Rush Current	I <sub>RUSH</sub>	-	-	3.5	A	(2)
Power Supply Current	White	-	1.2	1.5	A	(3)
	Black	-	0.5	-	A	
	Vertical Stripe	-	0.9	-	A	
LVDS Interface	Differential Input High Threshold Voltage	V <sub>LVTH</sub>	-	-	100	mV
	Differential Input Low Threshold Voltage	V <sub>LVTL</sub>	-100	-	-	mV
	Common Input Voltage	V <sub>LVC</sub>	1.125	1.25	1.375	V
	Terminating Resistor	R <sub>T</sub>	-	100	-	ohm
CMOS interface	Input High Threshold Voltage	V <sub>IH</sub>	2.7	-	3.3	V
	Input Low Threshold Voltage	V <sub>IL</sub>	0	-	0.7	V

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

Note (2) Measurement condition:



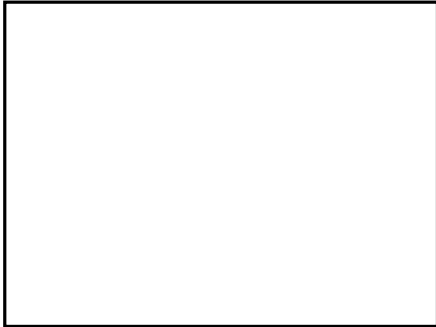
**Vcc rising time is 470us**





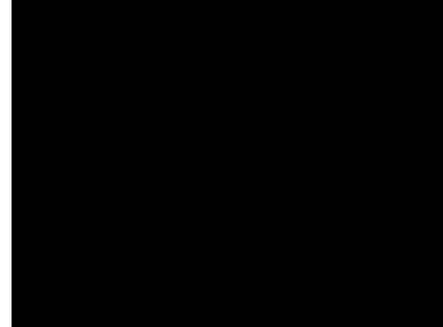
Note (3) The specified power supply current is under the conditions at  $V_{cc} = 12\text{ V}$ ,  $T_a = 25 \pm 2\text{ }^\circ\text{C}$ ,  $f_v = 60\text{ Hz}$ , whereas a power dissipation check pattern below is displayed.

a. White Pattern



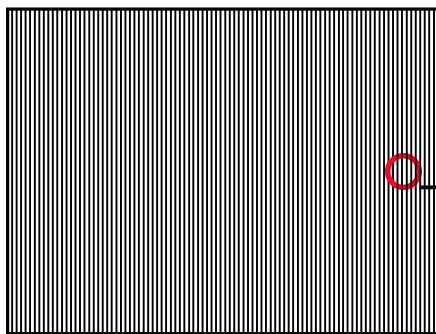
Active Area

b. Black Pattern

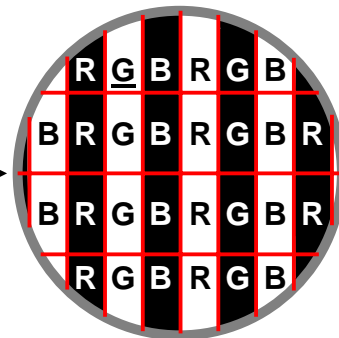


Active Area

c. Vertical Stripe Pattern



Active Area



### 3.2 BACKLIGHT UNIT

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

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V <sub>L</sub>	-	1460	-	V <sub>RMS</sub>	-
Lamp Current	I <sub>L</sub>	5.3	5.8	6.3	mA <sub>RMS</sub>	(1)
Lamp Turn On Voltage	V <sub>S</sub>	-	-	2450	V <sub>RMS</sub>	Ta = 0 °C
		-	-	2250	V <sub>RMS</sub>	Ta = 25 °C
Operating Frequency	F <sub>L</sub>	40	-	70	KHz	
Lamp Life Time	L <sub>BL</sub>	50,000	60,000	-	Hrs	(2)

#### 3.2.2 INVERTER CHARACTERISTICS (Ta = 25 ± 2 °C)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P <sub>BL</sub>	-	170	180	W	(5)(6), I <sub>L</sub> = 5.8mA
Power Supply Voltage	V <sub>BL</sub>	22.8	24	25.2	V <sub>DC</sub>	
Power Supply Current	I <sub>BL</sub>	-	7.1	-	A	Non Dimming
Input Ripple Noise	-	-	-	500	mV <sub>P-P</sub>	V <sub>BL</sub> = 22.8V
Backlight Turn on Voltage	V <sub>BS</sub>	2450	-	-	V <sub>RMS</sub>	Ta = 0 °C
		2250	-	-	V <sub>RMS</sub>	Ta = 25 °C
Oscillating Frequency	F <sub>W</sub>	47	50	53	kHz	
Dimming frequency	F <sub>B</sub>	150	160	170	Hz	
Minimum Duty Ratio	D <sub>MIN</sub>	-	20	-	%	

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

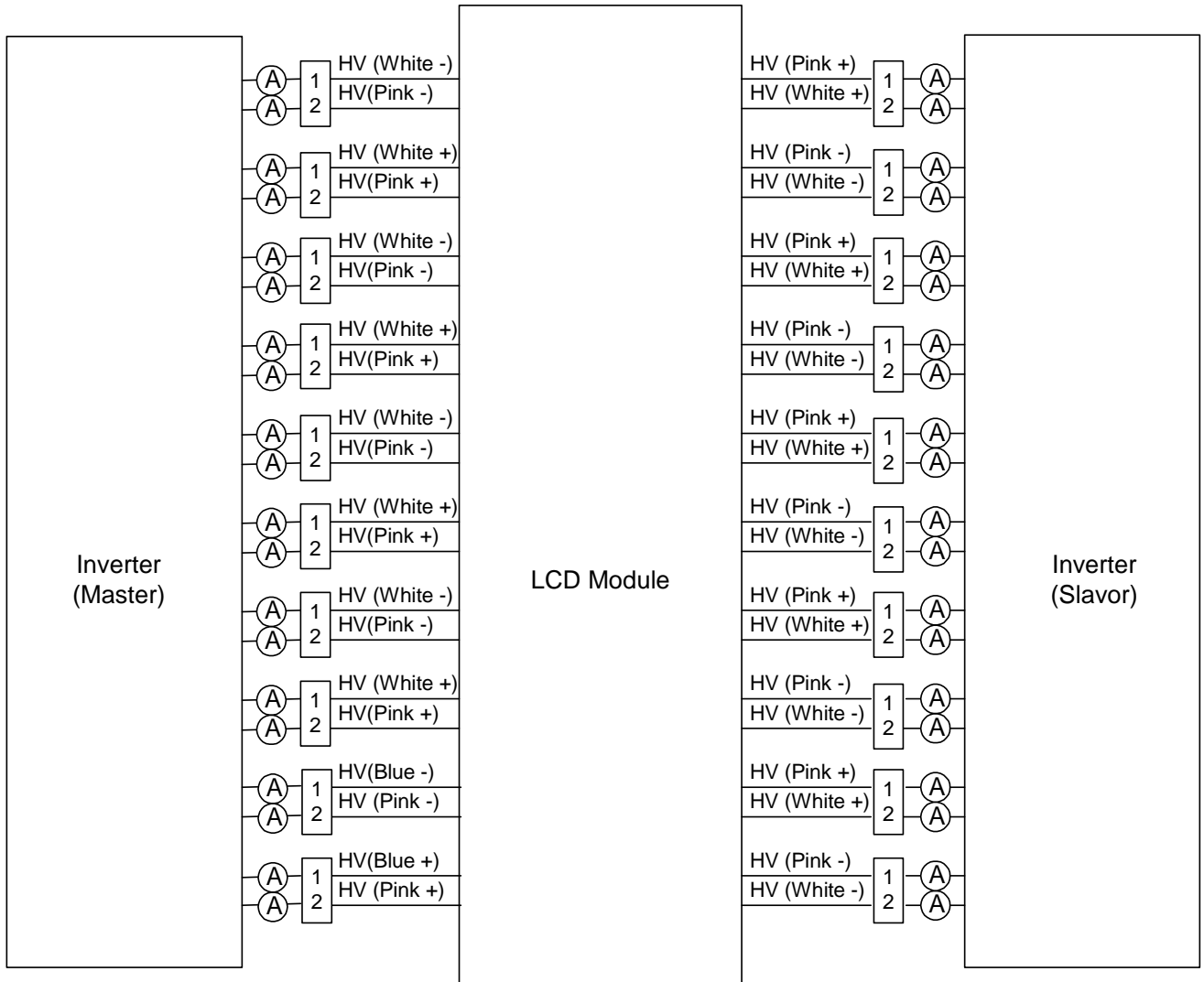
Note (2) The lamp starting voltage V<sub>S</sub> should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

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<sub>L</sub> = 5.3~ 6.3mA<sub>RMS</sub>.

Note (5) The power supply capacity should be higher than the total inverter power consumption P<sub>BL</sub>. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when inverter dimming.

Note (6) The measurement condition of Max. value is based on 42" backlight unit under input voltage 24V, average lamp current 6.1 mA and lighting 30 minutes later.



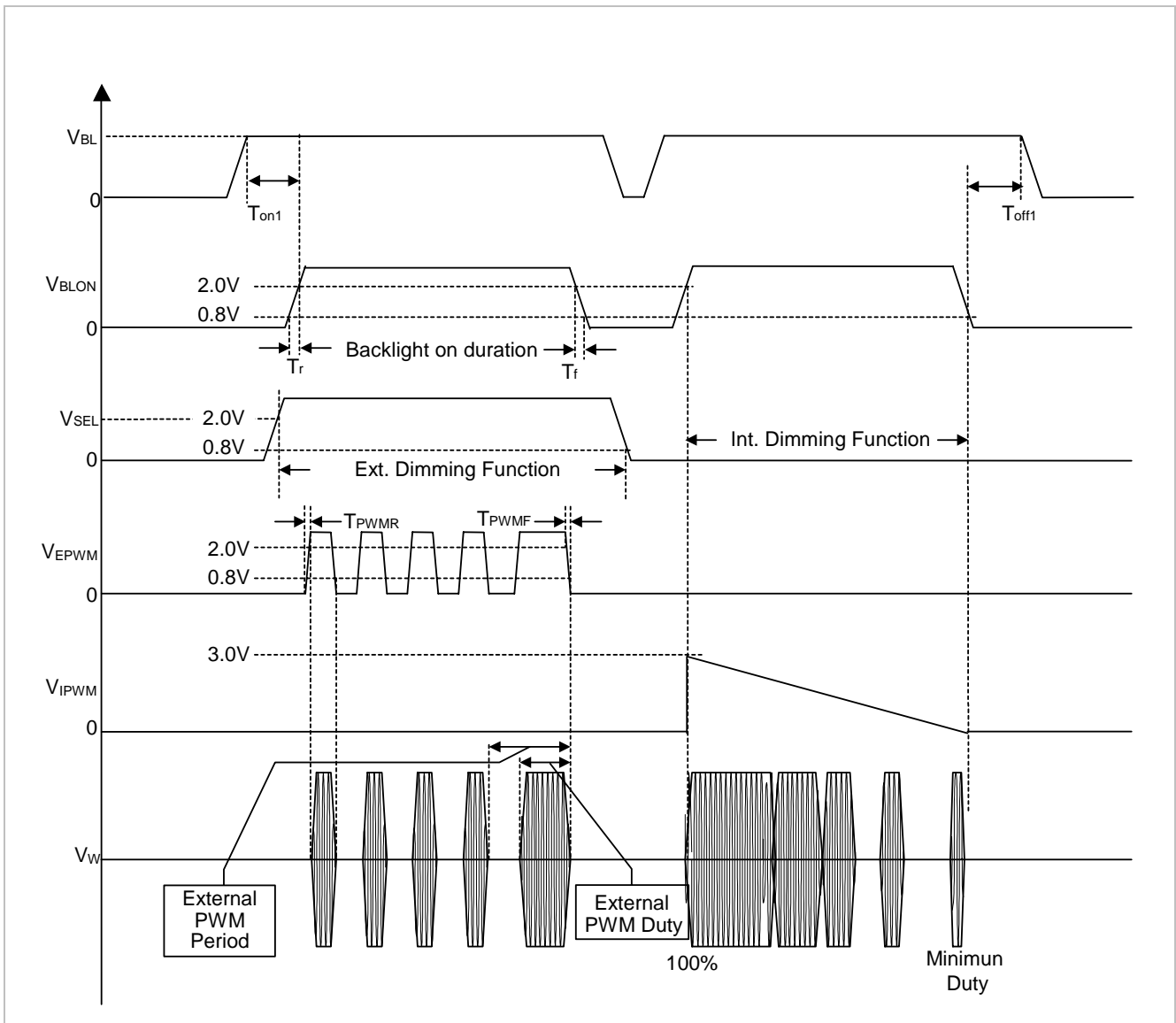
### 3.2.3 INVERTER INTERFACE CHARACTERISTICS

Parameter	Symbol	Test Condition	Value			Unit	Note	
			Min.	Typ.	Max.			
On/Off Control Voltage	ON	$V_{BLON}$	-	2.0	-	5.0	V	
	OFF		-	0	-	0.8	V	
Internal/External PWM Select Voltage	HI	$V_{SEL}$	-	2.0	-	5.0	V	
	LO		-	0	-	0.8	V	
Internal PWM Control Voltage	MAX	$V_{IPWM}$	$V_{SEL} = L$	2.85	3.0	3.15	V	maximum duty ratio
	MIN			-	0	-	V	minimum duty ratio
External PWM Control Voltage	HI	$V_{EPWM}$	$V_{SEL} = H$	2.0	-	5.0	V	duty on
	LO			0	-	0.8	V	duty off
Control Signal Rising Time	$T_r$	-	-	-	100	ms		
Control Signal Falling Time	$T_f$	-	-	-	100	ms		
PWM Signal Rising Time	$T_{PWMR}$	-	-	-	50	us		
PWM Signal Falling Time	$T_{PWMF}$	-	-	-	50	us		
Input impedance	$R_{IN}$	-	1	-	-	M		
BLON Delay Time	$T_{on}$	-	1	-	-	ms		
BLON Off Time	$T_{off}$	-	1	-	-	ms		

Note (1) The SEL signal should be valid before backlight turns on by BLON signal. It is inhibited to change the internal/external PWM selection (SEL) during backlight turn on period.

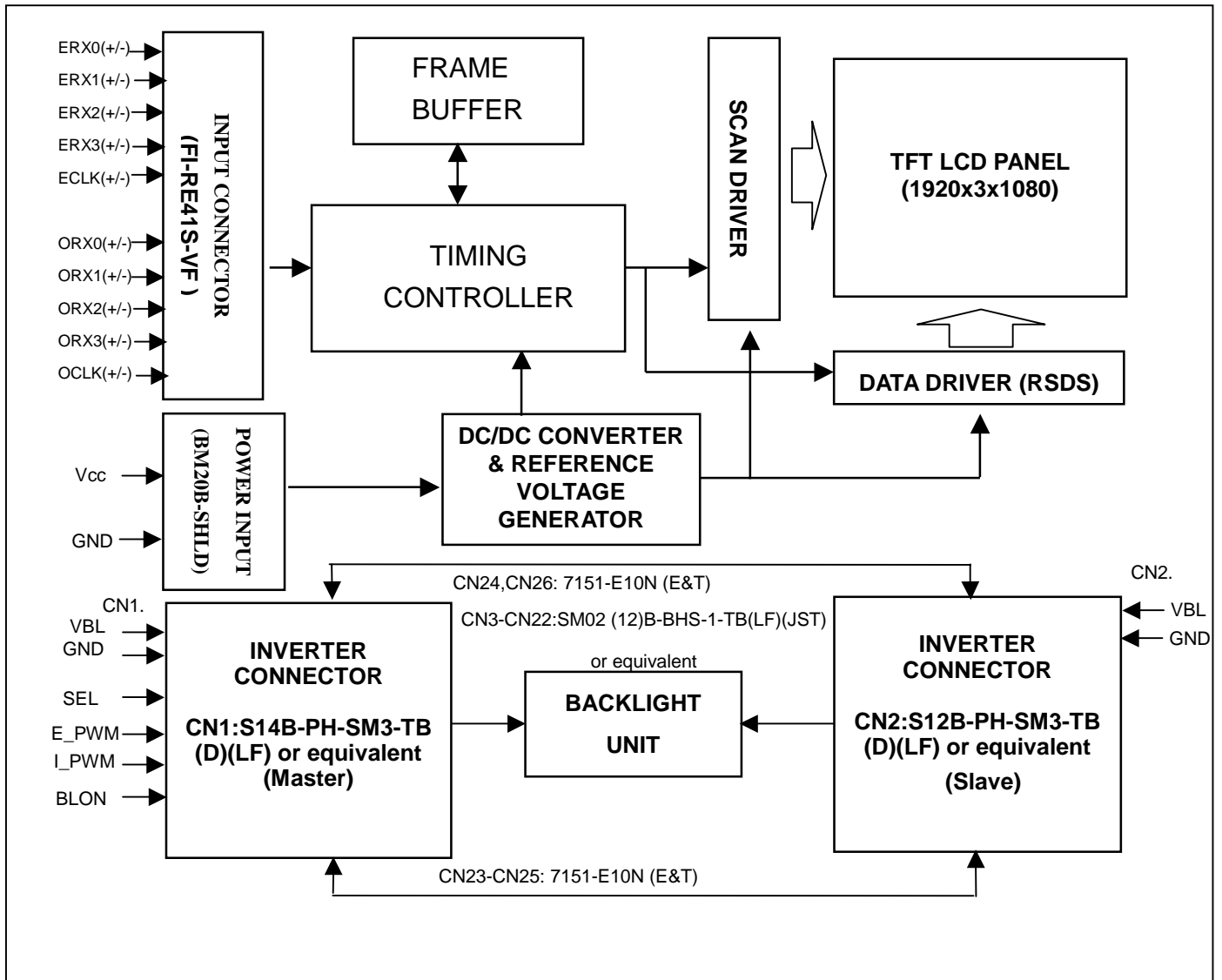
Note (2) The power sequence and control signal timing are shown in the following figure.

Note (3) The power sequence and control signal timing must follow the figure below. For a certain reason, the inverter has a possibility to be damaged with wrong power sequence and control signal timing.



#### 4. BLOCK DIAGRAM OF INTERFACE

##### 4.1 TFT LCD MODULE



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD Module Input

#### 5.1.1 TFT LCD Module Signal Input

CNF1 Connector Pin Assignment:

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

Note (1) Connector part no. : JAE FI-RE41S-VF.

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

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 to the frame rate to optimize image quality.

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

Note (5) Left it open or connect to ground.

### 5.1.2 TFT LCD Module Power Input

CNF2 Connector Pin Assignment:

Pin	Name	Description	Note
1	VCC	Power input (+12V)	
2	VCC	Power input (+12V)	
3	VCC	Power input (+12V)	
4	VCC	Power input (+12V)	
5	VCC	Power input (+12V)	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	GND	Ground	
10	GND	Ground	
11	N.C.	No Connection	(2)
12	N.C.	No Connection	
13	N.C.	No Connection	
14	N.C.	No Connection	
15	N.C.	No Connection	
16	N.C.	No Connection	
17	N.C.	No Connection	
18	N.C.	No Connection	
19	N.C.	No Connection	
20	N.C.	No Connection	

Note (1) Connector part no. : JST BM20B\_SHLDS-G-TFT.

Note (2) Reserved for internal use. Please left it open.



## 5.2 BACKLIGHT UNIT

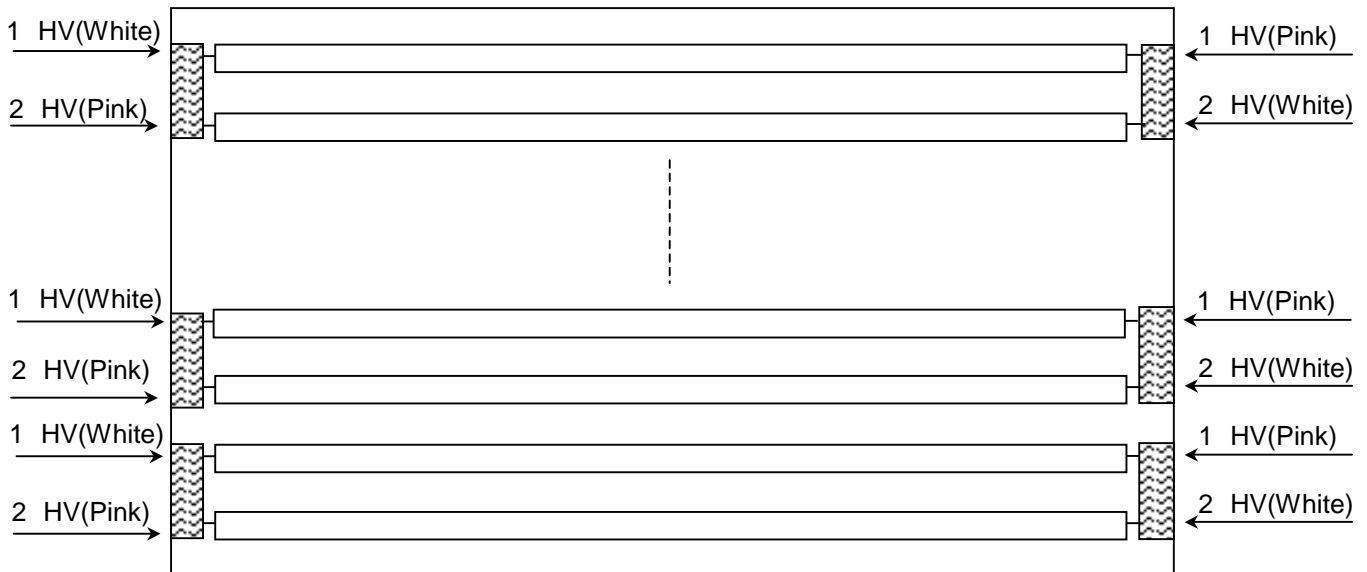
The pin configuration for the housing and the leader wire is shown in the table below.

CN3-CN22: BHR-04VS-1 (JST).

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

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 INVERTER UNIT

CN1 (Header): S14B-PH-SM3-TB (D)(LF)(JST) or equivalent.

Pin No.	Symbol	Description
1	VBL	+24V <sub>DC</sub> power input
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		
11	SEL	Internal/external PWM selection High : external dimming Low : internal dimming
12	E_PWM	External PWM control signal E_PWM should be connected to ground when internal PWM was selected (SEL = Low).
13	I_PWM	Internal PWM Control Signal I_PWM should be connected to ground when external PWM was selected (SEL = High).
14	BLON	Backlight on/off control

CN2 (Header): S12B-PH-SM3-TB (D)(LF)(JST) or equivalent.

Pin No.	Symbol	Description
1	VBL	+24V <sub>DC</sub> power input
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		
11	NC	NC
12	NC	NC

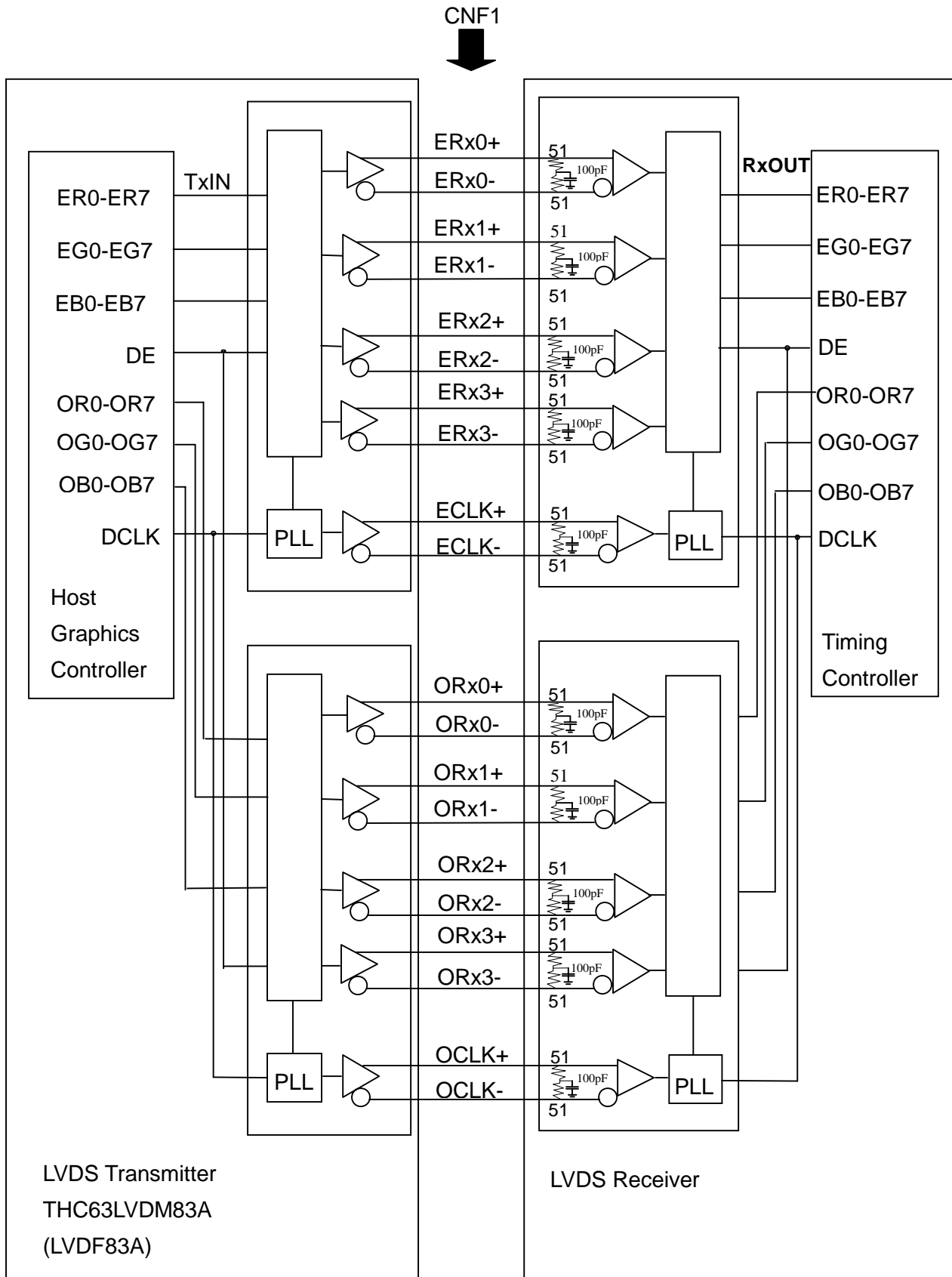
CN3- CN22 (Header): SM02(12)B-BHS-1-TB (LF)(JST) or equivalent

Pin No.	Symbol	Description
1	CCFL HOT	CCFL high voltage
2	CCFL HOT	CCFL high voltage

CN23-CN26 (Header): 7151-E10N (E&amp;T)

Pin No.	Symbol	Description
1	Control Signal	Board to Board
2		Board to Board
3		Board to Board
4		Board to Board
5		Board to Board
6		Board to Board
7		Board to Board
8		Board to Board
9		Board to Board
10		Board to Board

**5.4 BLOCK DIAGRAM OF INTERFACE**



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 Odd pixel and the second pixel is Even pixel.

### 5.5 LVDS INTERFACE

	SIGNAL		TRANSMITTER THC63LVDM83 A		INTERFACE CONNECTOR		RECEIVER THC63LVDF84A		TFT CONTROL INPUT	
	LVDS_SEL =L	LVDS_SEL = H or OPEN	PIN	INPUT	Host	TFT-LCD	PIN	OUTPUT	LVDS_SEL = L	LVDS_SEL = H or OPEN
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+	RxCLK IN+	26	RxCLK	DCLK	
					TxCLK OUT-	RxCLK IN-		OUT		

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".

### 5.6 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	1	0	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	1	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	1	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	1	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

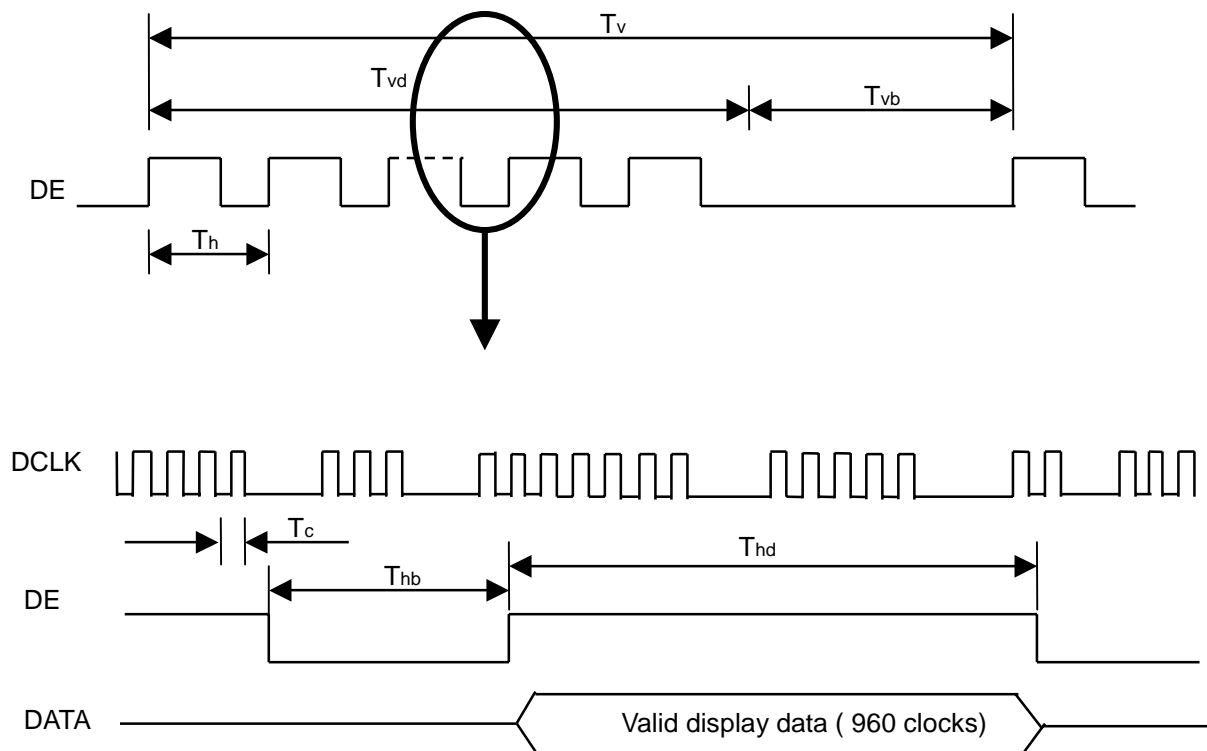
The input signal timing specifications are shown as the following table and timing diagram.

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	1139	Th	Tv=Tvd+Tvb
	Display	Tvd	1080	1080	1080	Th	-
Horizontal Active Display Term	Total	Th	(2100)	2200	(2300)	Tc	Th=Thd+Thb
		Display	Thd	1920	1920	1920	Tc
	Blank	Tvb	(35)	45	59	Th	-
		Thb	(180)	280	(380)	Tc	-

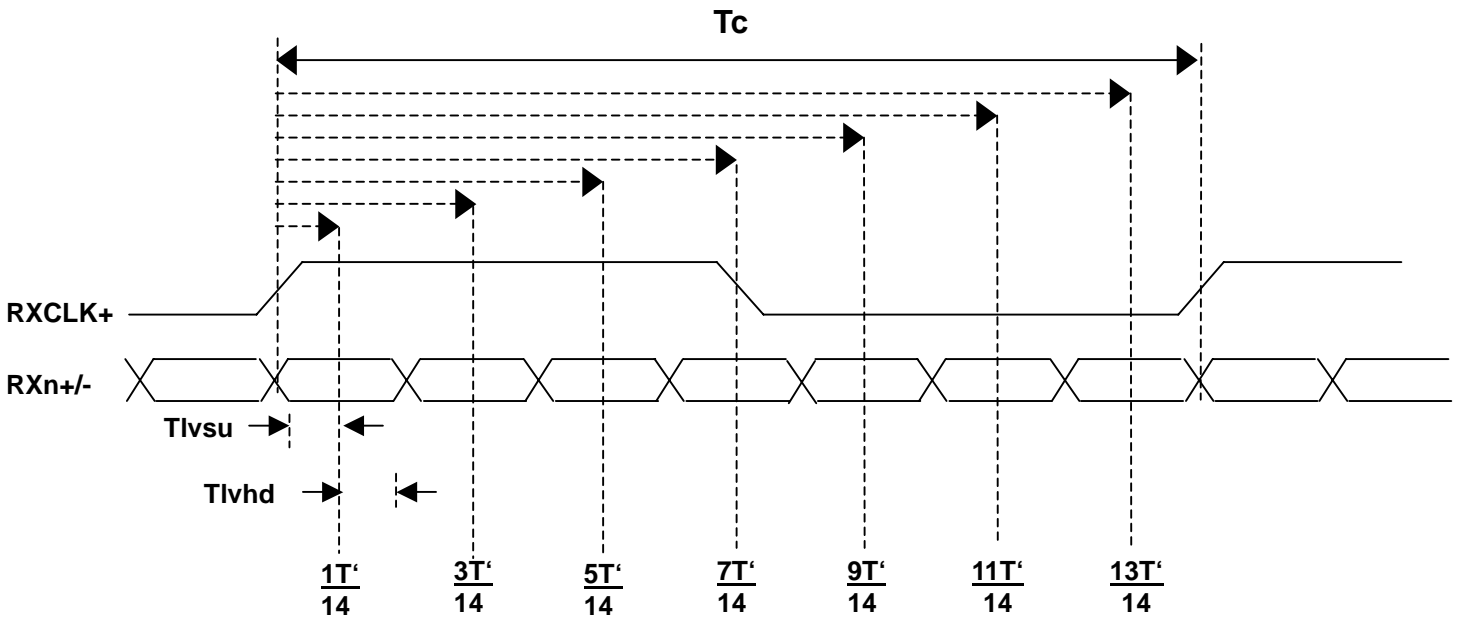
Note (1) (ODSEL) = (H) , (L). Please refer to 5.1 for detail information.

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

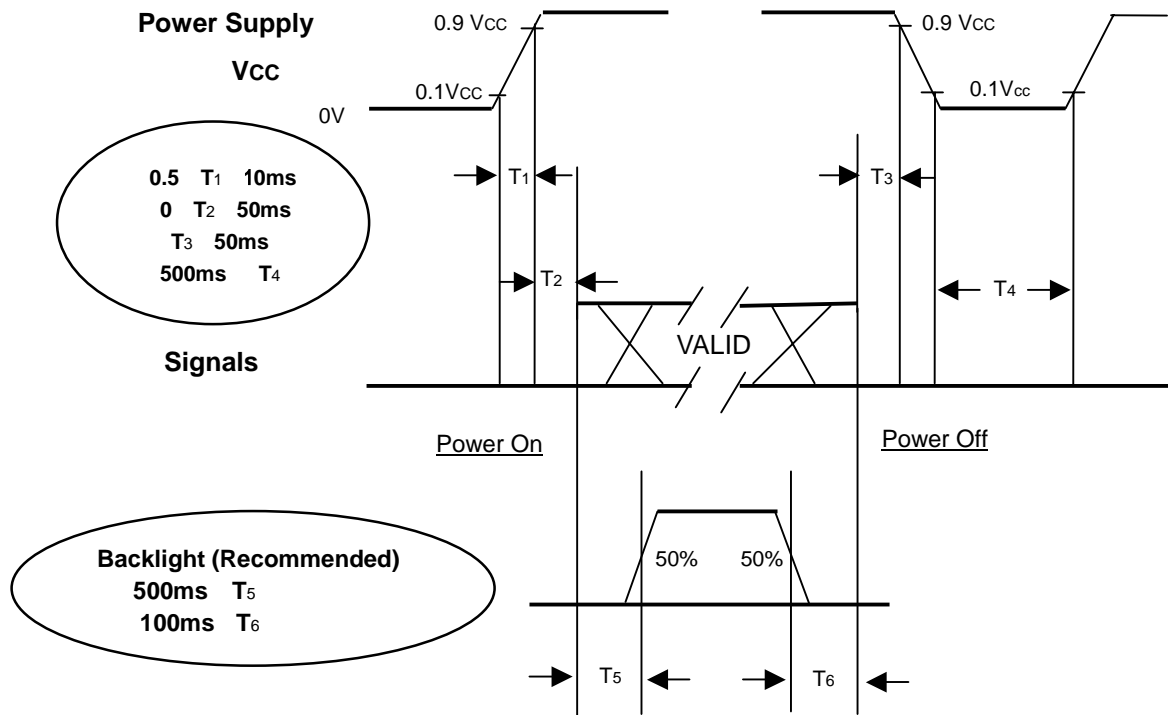


**LVDS INPUT INTERFACE TIMING DIAGRAM**



## 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 V<sub>CC</sub>.
- (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 V<sub>CC</sub> is in off level, please keep the level of input signals on the low or high impedance.
- (4) T<sub>4</sub> 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.

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V <sub>CC</sub>	12/18	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I <sub>L</sub>	5.8±0.5	mA
Oscillating Frequency (Inverter)	F <sub>W</sub>	50±3	KHz
Vertical Frame Rate	Fr	60	Hz

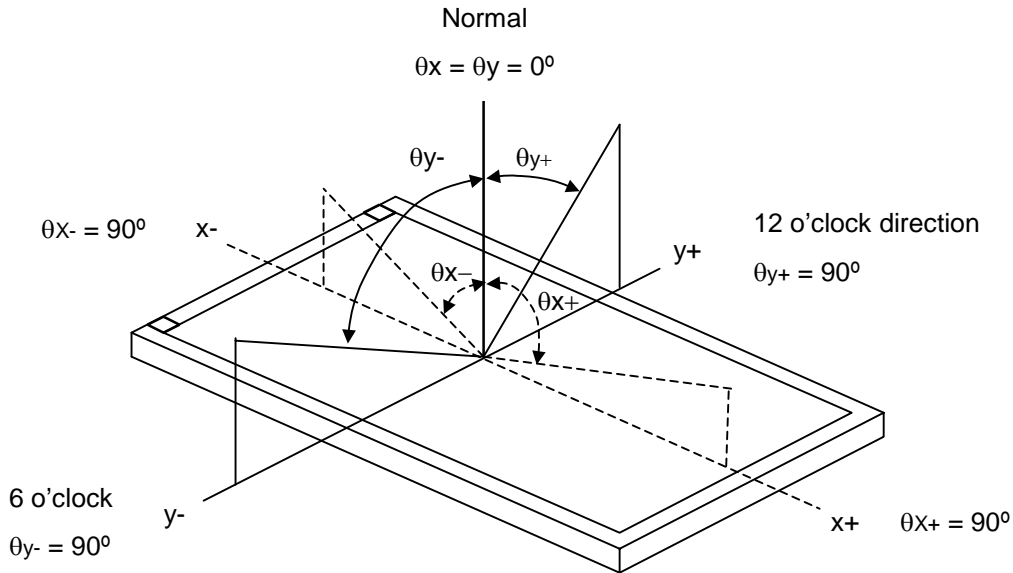
### 7.2 OPTICAL SPECIFICATIONS

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 (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio		CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	900	1200		-	Note (2)	
Response Time		Gray to gray			6.5	12	ms	Note (3)	
Center Luminance of White		L <sub>C</sub>		400	500		cd/m <sup>2</sup>	Note (4)	
White Variation		$\delta W$				1.25	-	Note (7)	
Cross Talk		CT				4	%	Note (5)	
Color Chromaticity	Red	R <sub>x</sub>		Viewing Normal Angle	Typ. -0.03	0.648	Typ. +0.03	-	Note (6)
		R <sub>y</sub>				0.332		-	
	Green	G <sub>x</sub>				0.271		-	
		G <sub>y</sub>				0.595		-	
	Blue	B <sub>x</sub>				0.144		-	
		B <sub>y</sub>	0.060			-			
	White	W <sub>x</sub>	0.272			-			
W <sub>y</sub>	0.278	-							
Color Gamut		C.G	72	75		%	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				

Note (1) Definition of Viewing Angle ( $\theta_x, \theta_y$ ):

Viewing angles are measured by Eldim EZ-Contrast 160R



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

The contrast ratio can be calculated by the following expression.

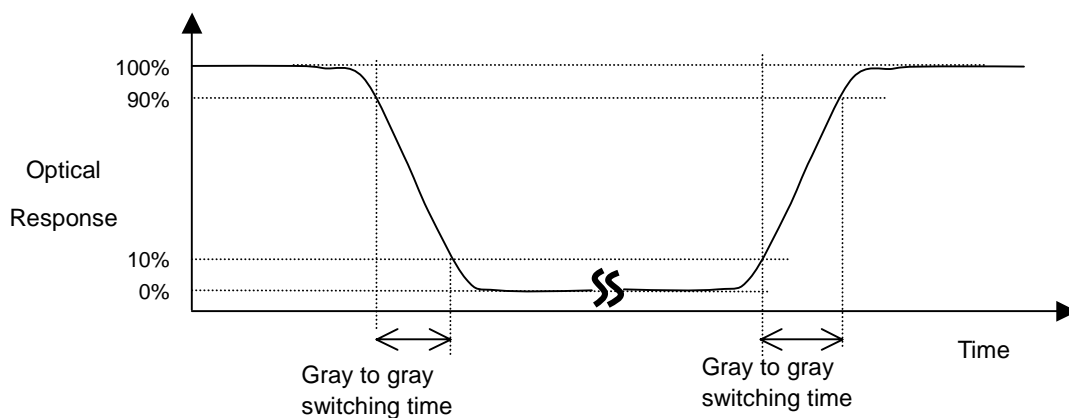
$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$CR = CR(X)$ , 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 :



The driving signal means the signal of gray level 0, 63, 127, 191, and 255.

Gray to gray average time means the average switching time of gray level 0, 63,127,191,255 to each other.

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).

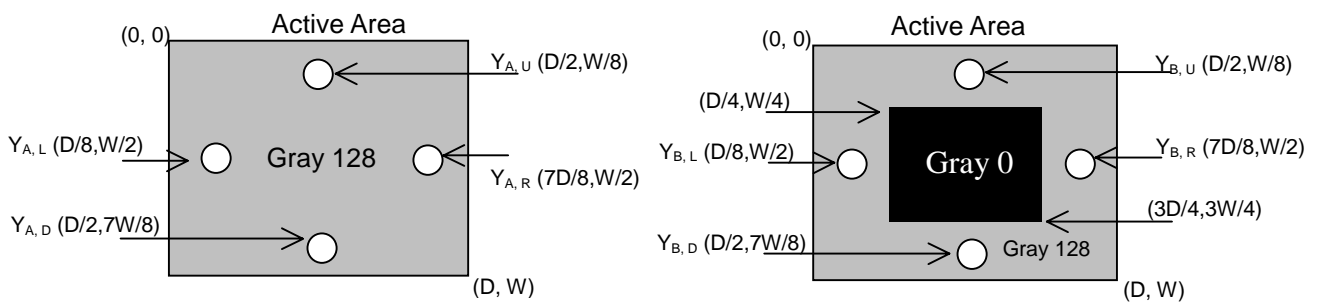
Note (5) Definition of Cross Talk (CT):

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

Where:

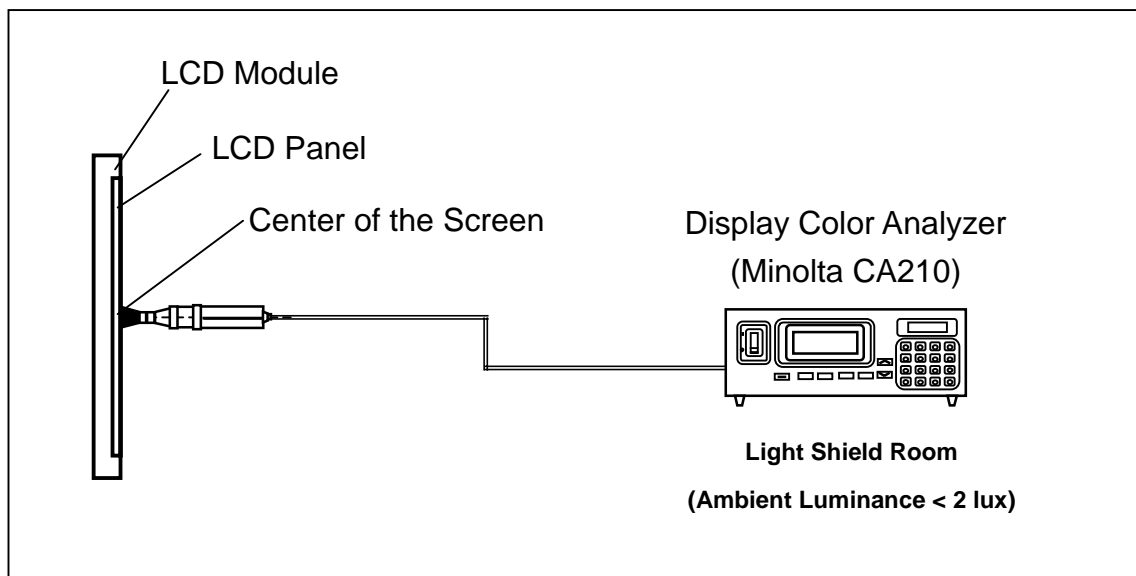
$Y_A$  = Luminance of measured location without gray level 0 pattern ( $cd/m^2$ )

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



Note (6) Measurement Setup:

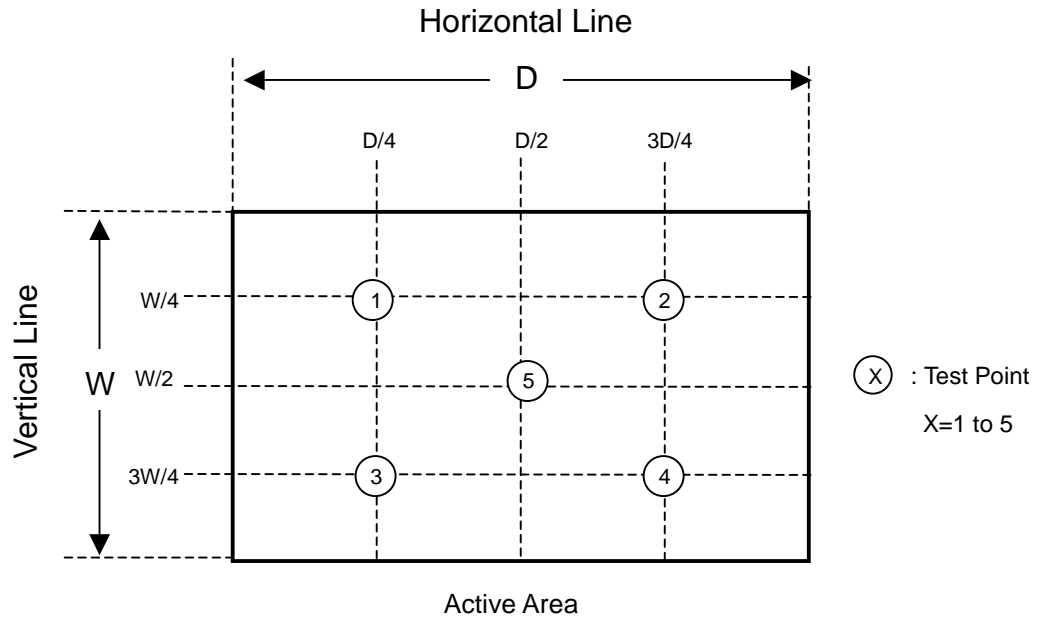
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 1 hour in a windless room.



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

Measure the luminance of gray level 255 at 5 points

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



## 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) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.
- (10) When ambient temperature is lower than 10°C, 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

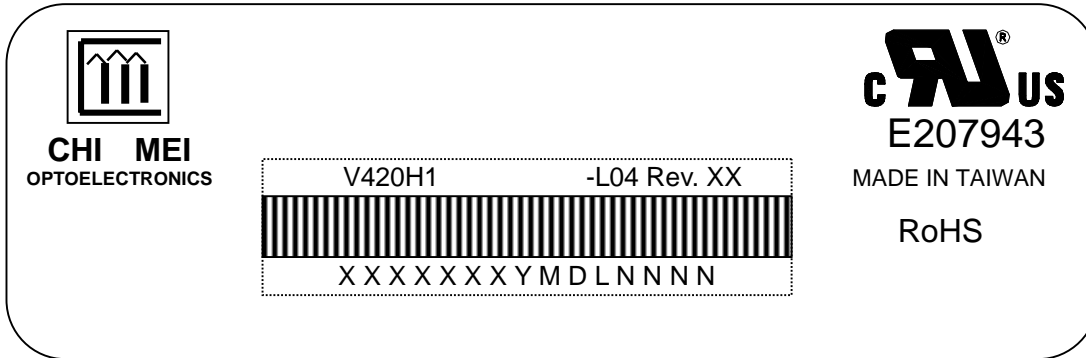
- (1) The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.
- (2) If the liquid crystal material leaks from the panel, it should be kept away from the 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.



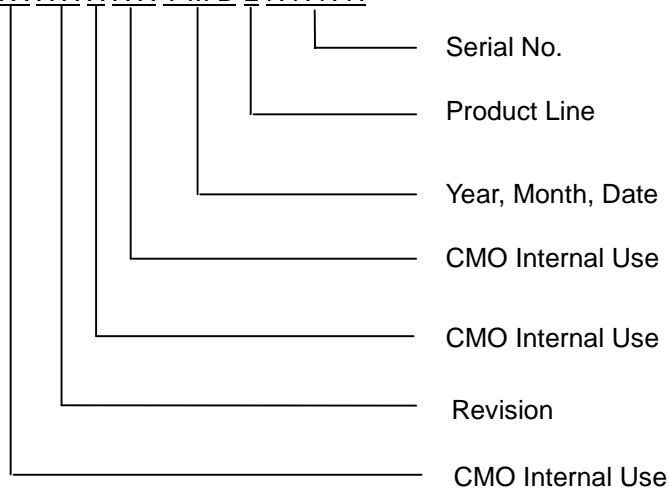
**9. DEFINITION OF LABELS**

**9.1 CMO MODULE LABEL**

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



- (a) Model Name: V420H1-L04
- (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 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 1<sup>st</sup> to 31<sup>st</sup>, 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.

## 10. PACKAGING

### 10.1 packing specifications

- (1) 3 LCD TV modules / 1 Box
- (2) Box dimensions : 1086(L) X 356 (W) X 715 (H)
- (3) Weight : approximately 46.5Kg ( 3 modules per box)

### 10.2 PACKING METHOD

Figures 10-1 and 10-2 are the packing method

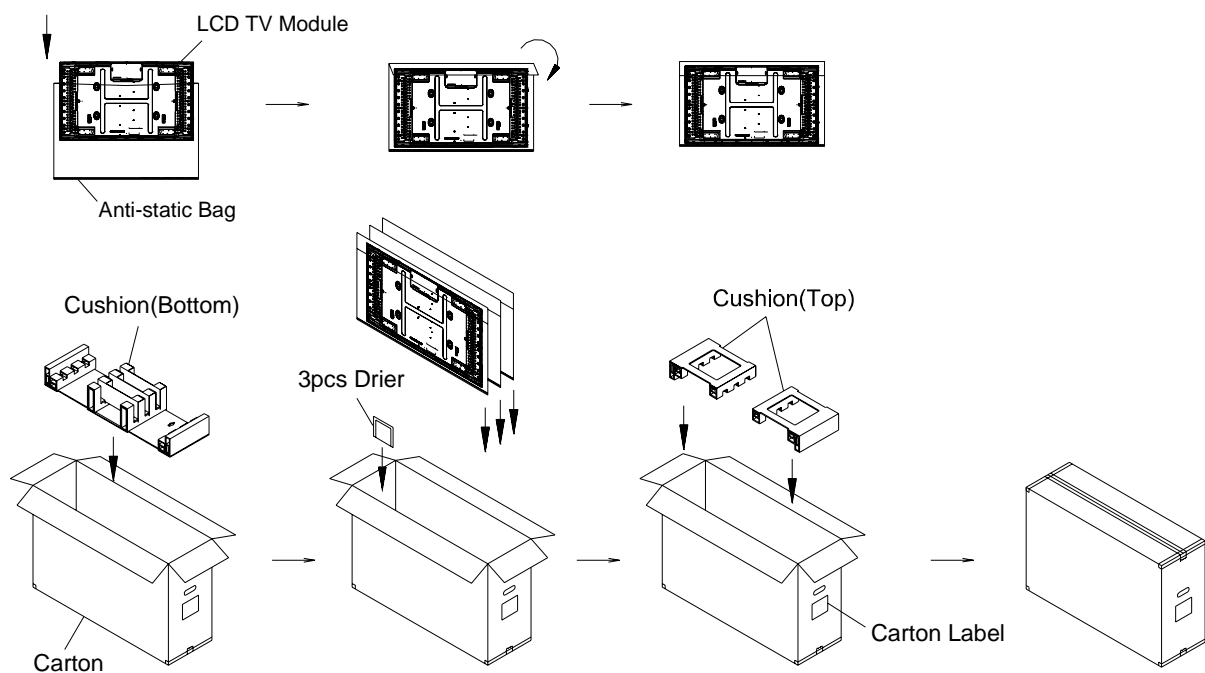


Figure.10-1 packing method

Corner Protector:L1400\*50mm\*50mm  
L1000\*50mm\*50mm  
Pallet:L1100\*W1100\*H140mm  
Pallet Stack:L1100\*W1100\*H1575mm  
Gross:294kg

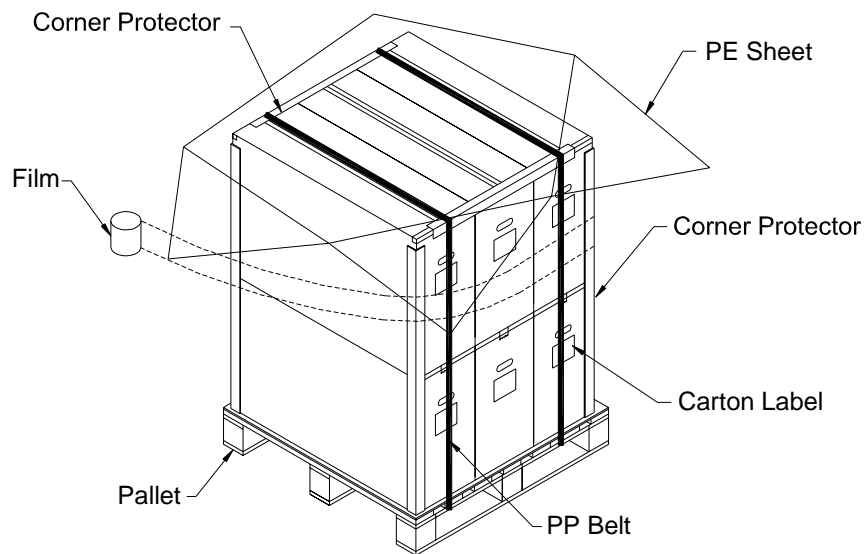
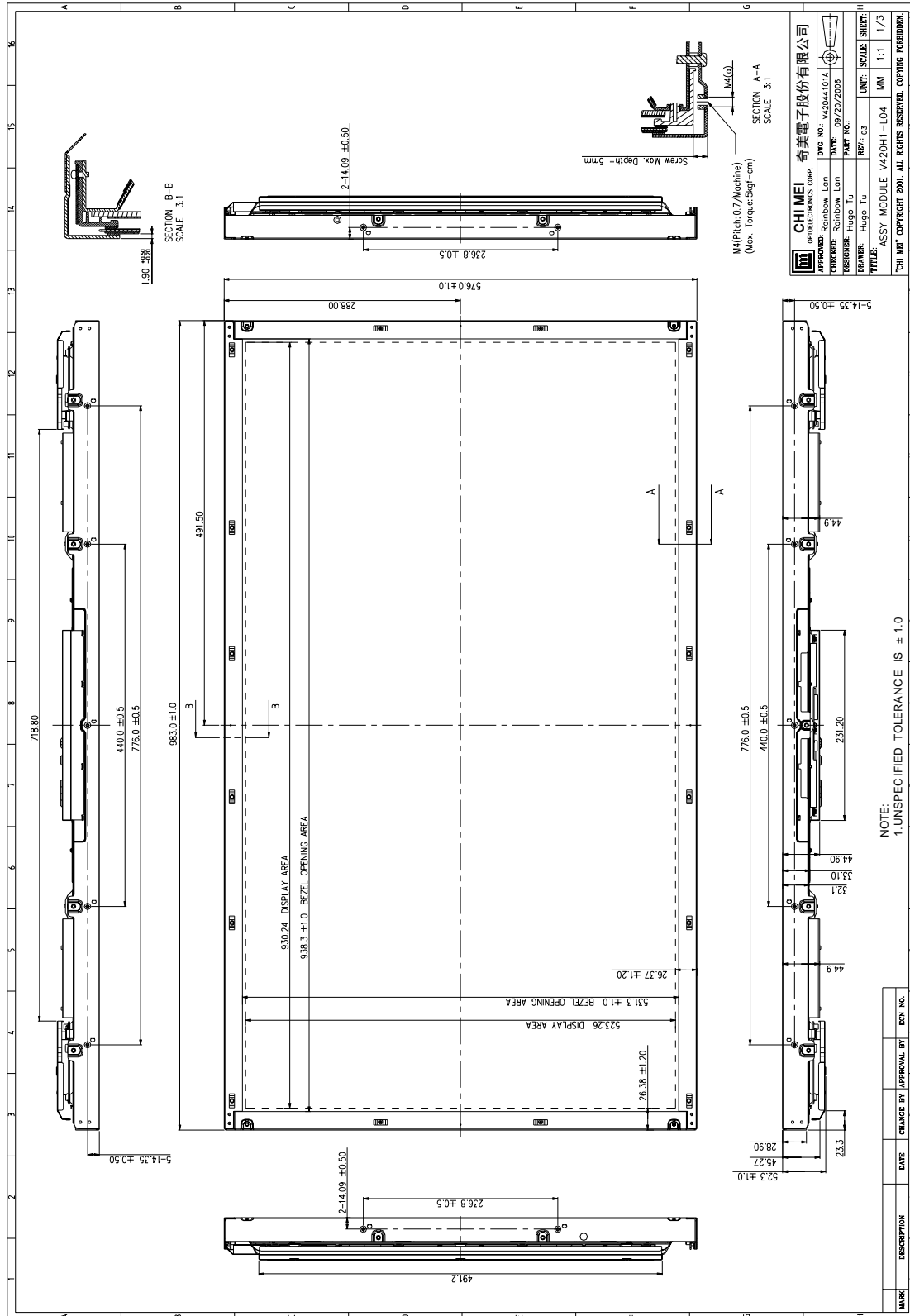
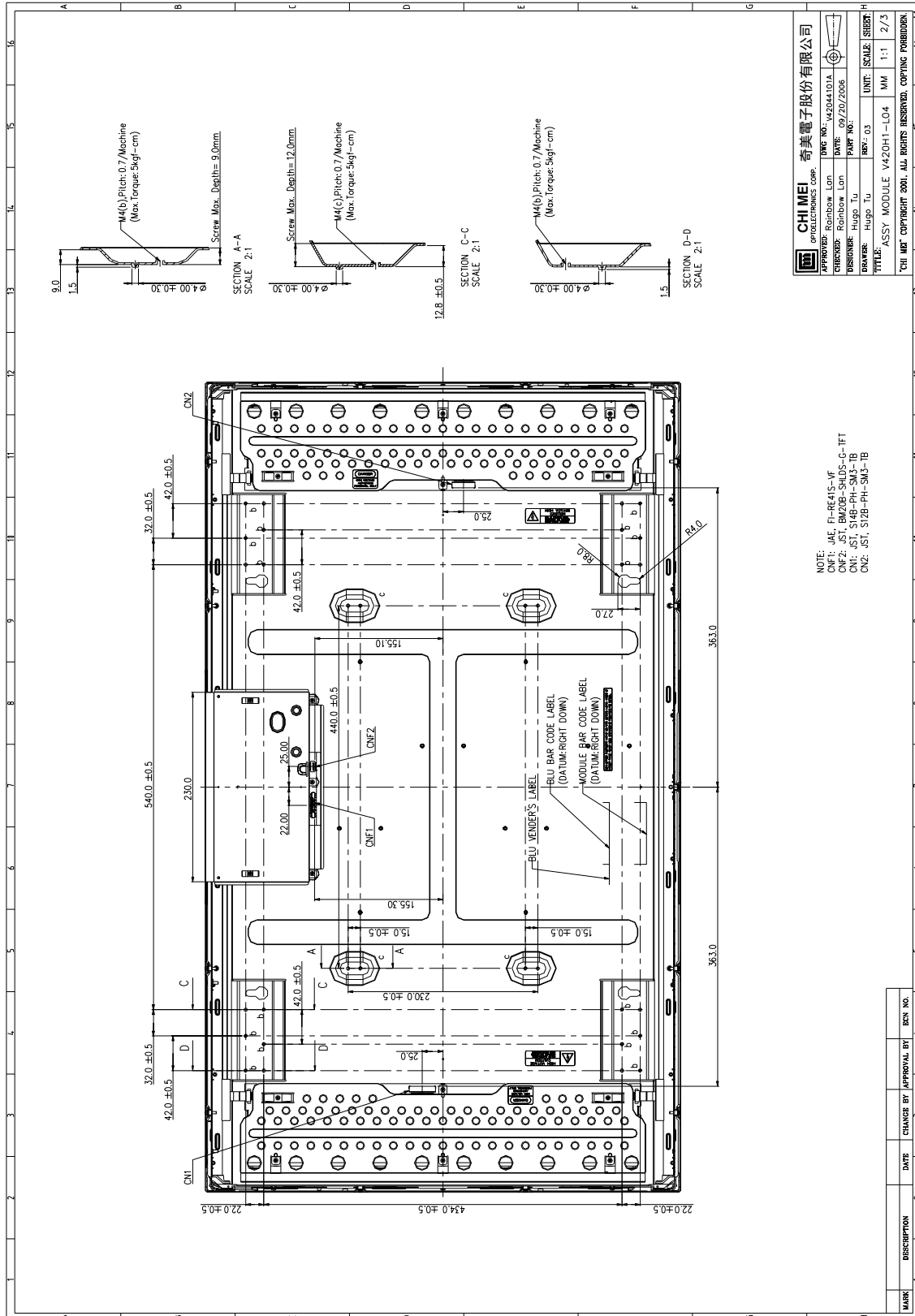


Figure.10-2 Packing method

**11. MECHANICAL CHARACTERISTICS**





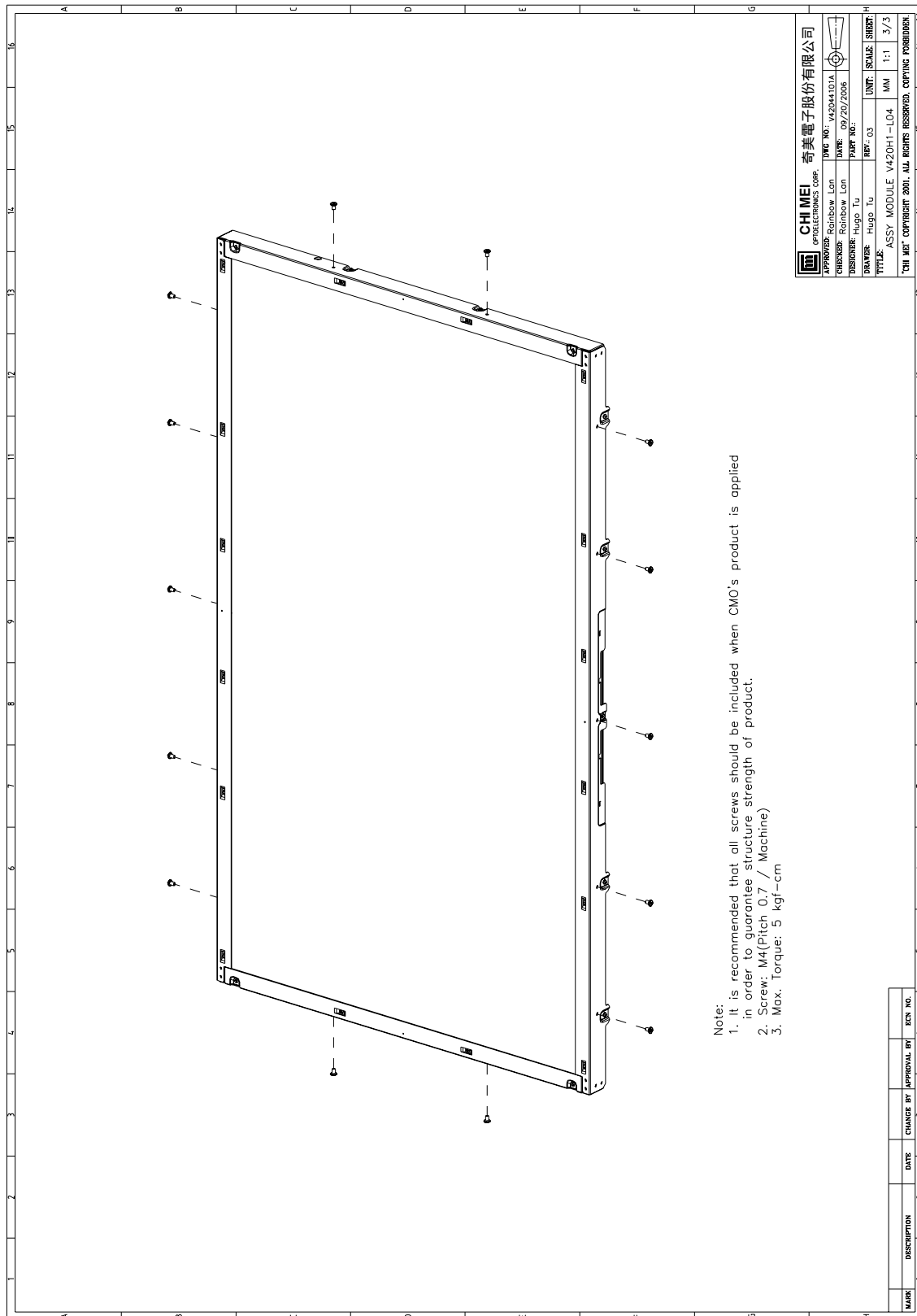
**CHI MEI**  
 OPTOELECTRONICS CORP.  
 奇美電子股份有限公司

APPROVED: Rainbow Lon  
 CHECKED: Rainbow Lon  
 DESIGNED: Hugo Tu  
 DRAWER: Hugo Tu


DWG. NO.: V420H1-01A  
 DATE: 09/20/2006  
 PART NO.:  
 REV.: 03

UNIT: SCALE: SHEET: H  
 1:1 2/3

TITLE: ASSY MODULE V420H1-L04  
 'CHI MEI' COPYRIGHT 2001. ALL RIGHTS RESERVED. COPYING FORBIDDEN.



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: 5 kgf-cm

 <b>CHI MEI</b> OPTOELECTRONICS CORP. 奇美電子股份有限公司	
APPROVED: 邱啟雄 LCN	DATE: 09/20/2006
CHECKER: 邱啟雄 LCN	PART NO.:
DESIGNER: 吳智 王	REP.: 03
DRAWER: 吳智 王	UNIT: SCALE: SUBST: 1:1
TITLE: ASSY MODULE V420H1-L04 MM 1:1 3/3 CHI MEI COPYRIGHT 2001. ALL RIGHTS RESERVED. COPYING FORBIDDEN.	

MARK	DESCRIPTION	DATE	CHANGE BY	APPROVAL BY	ECN NO.