CHI MEI
OPTOELECTRONICS CORP.

Approval

TFT LCD Approval Specification

MODEL NO.: V296W1　- L14

Customer: _____

Approved by: _____

Note:

LCD TV Head Division	
Director	郭振隆

Liquid Crystal Display Division			
QRA Dept.	DDIII	DDII	DDI
Approval	Approval	Approval	Approval
陳永一	李汪洋	藍文錦	林文聰

LCD TV Marketing and Product Management Dept.	
Project Manager	陳立宜　黃富瑞　謝芳宜

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.　**Version 2.1**

Approval

- CONTENTS -

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

CHI MEI
OPTOELECTRONICS CORP.

Approval

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Dec.26,'03	All	All	Approval Specification was first issued.
Ver 2.1	Dec.24,'04	4	1.2	High contrast ratio (600:1) → (800:1)
		12	5.1	Connector Part No.: FI-SE30P-HF (JAE) → FI-SE30P-HFE (JAE)
		13	5.2	Note(1)The mating connector on inverter part number is SM02(8.0)-BHS-1-TB → SM02(8.0)B-BHS-1-TB(LF)
				Note(2)The mating connector on inverter part number is S2B-ZR-SM3A-TF → S2B-ZR-SM4A-TF(LF)
		14	5.3	CN1:S10B-PH-SM3-TB → S10B-PH-SM3-TB(D)(LF)
				CN2: S12B-PH-SM3-TB → S12B-PH-SM3-TB(D)(LF)
				CN3~10: SM02(8.0)B-BHS-1-TB(JST) → SM02(8.0)B-BHS-1-TB(LF)(JST)
				CN11: S2B-ZR-SM3A-TF(JST) → S2B-ZR-SM4A-TF(LF)(JST)
		20	7.2	Contrast Ratio
				Min. 400 → 600
				Typ. 600 → 800
				Response Time Gray to Gray:
				Typ. 16.6 → 8
				Max. 25 → 12
		21	7.2	Note(3) Definition of Gray to Gray Switching Time
		25	8.2	Figure. 8-2 Packing method

Approval

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V296W1- L14 is a 30" TFT Liquid Crystal Display module with 16-CCFL Backlight unit and 1ch-LVDS interface. This module supports 1280 x 768 WXGA format and can display true 16.7M colors (8-bit/color). The inverter module for backlight is built-in.

1.2 FEATURES

- Ultra wide viewing angle – Super MVA technology

- High brightness (550 nits)

- High contrast ratio (800:1)

- Fast response time

- High color saturation NTSC 75%

- WXGA (1280 x 768 pixels) resolution

- DE (Data Enable) only mode

- LVDS (Low Voltage Differential Signaling) interface

1.3 APPLICATION

- TFT LCD TVs

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	643.2(H) x 385.92 (V)　(29.53" diagonal)	mm	(1)
Bezel Opening Area	648.8 (H) x 391.52 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 768	pixel	-
Pixel Pitch (Sub Pixel)	0.1675 (H) x 0.5025 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Display Operation Mode	Transmissive mode / Normally black	-	-
Surface Treatment	Anti-glare with anti-reflective coating Hard coating (2H), Haze : 40% Reflection rate : < 2%	-	-

1.5 MECHANICAL SPECIFICATIONS

	Item	Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)		683.6		mm	(1), (2)
	Vertical(V)		433.6		mm	
	Depth(D)	-		43	mm	
Weight		-	5500		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.

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification. **Version 2.1**

CHI MEI
OPTOELECTRONICS CORP.

Approval

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}	-	100	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 $\leqq$ 40 ºC).

    (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).
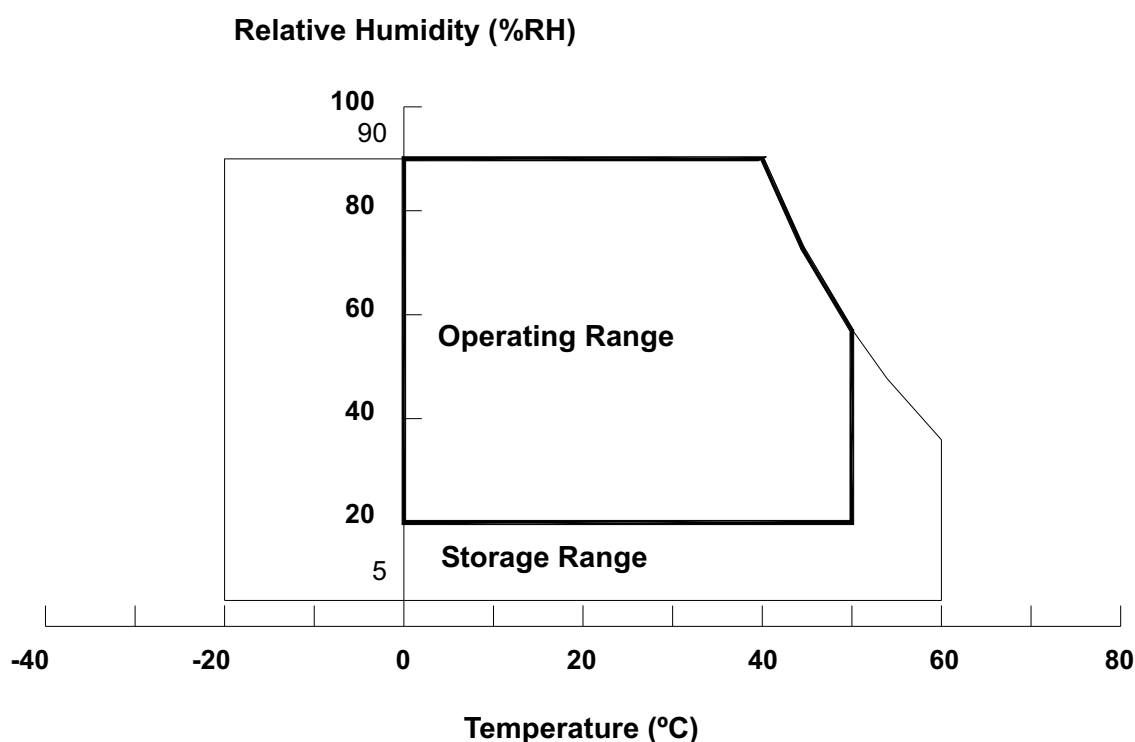
    (c) No condensation.

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 60 ºC with LCD module alone in a temperature controlled chamber.

    Thermal management should be considered in your product design to prevent the surface temperature of

    display area from being over 60 ºC. The range of operating temperature may degrade in case of improper

    thermal management in your product design.

Note (3) 2 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 500 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)

Temperature (ºC)

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval

2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+6.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	4.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Test Condition	Min.	Type	Max.	Unit	Note
Lamp Voltage	V_W	Ta = 25 ℃	—	—	3000	V_{RMS}	
Input Voltage	V_{BL}	—	0	—	30	V	(1), (2), I_L = 4.5 mA
On/Off Control Voltage	V_{BLON}	—	-0.3	—	7	V	(1), (2)
Internal/External PWM Select Voltage	V_{SEL}	—					
Internal PWM Control Voltage	V_{IPWM}	—					
External PWM Control Voltage	V_{EPWM}	—					
Operating Temperature	T_{OP}	5～95% RH	0	—	75	℃	(3)
Storage Temperature	T_{ST}	5～95% RH	-30	—	80	℃	

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) Specified values are for lamp and inverter (Refer to 3.2 for further information).

Note (3) Protect inverters from moisture condensation and freezing.

3. ELECTRICAL CHARACTERISTICS

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

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	-	200	mV	-
Rush Current		I_{RUSH}	-	-	3.0	A	(2)
Power Supply Current	White	Icc	-	1.5	-	A	(3)a
	Black		-	0.8	-	A	(3)b
	Vertical Stripe		-	1.2	-	A	(3)c
LVDS differential input high threshold voltage		V_{TH}	-	-	+100	mV	
LVDS differential input low threshold voltage		V_{TL}	-100	-	-	mV	
LVDS common input voltage		Vic	1.125	1.25	1.375	V	
Terminating Resistor		R_T	-	100	-	ohm	

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

Note (2) Measurement Conditions:

Approval
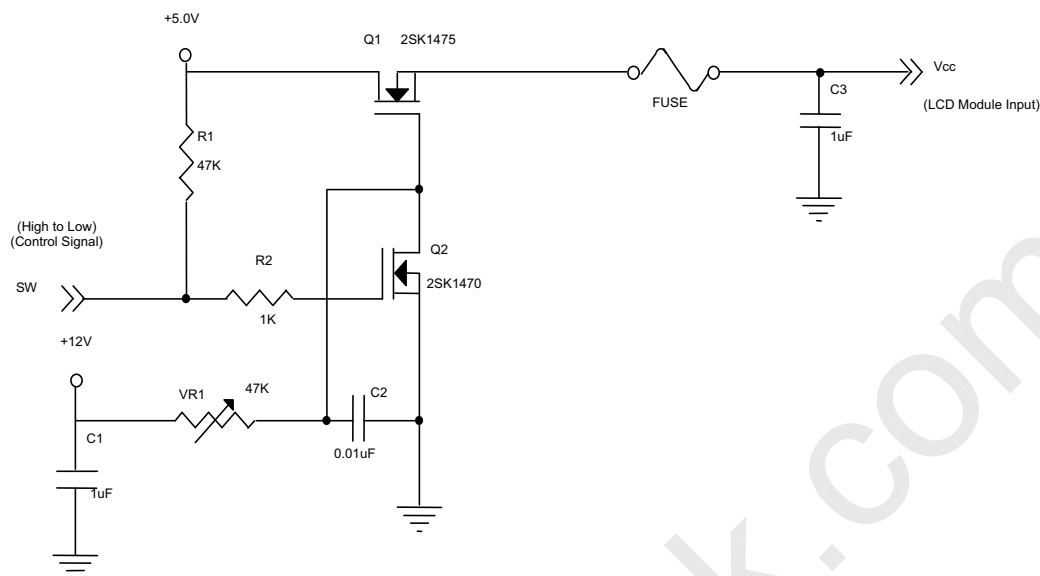
Vcc rising time is 470μs
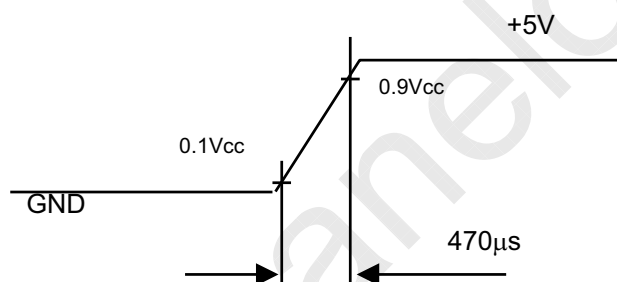
Note (3) The specified power supply current is under the conditions at Vcc = 5 V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

7

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval
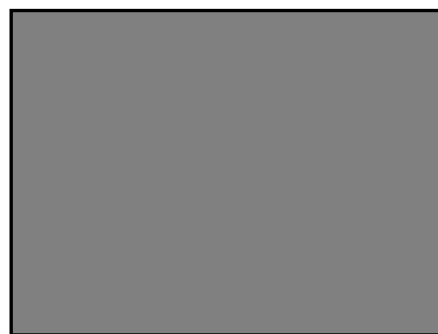
c. Vertical Stripe Pattern

Active Area

3.2 BACKLIGHT INVERTER UNIT

3.2.1 Initial Characteristics

Ta = 25 ± 2 ºC

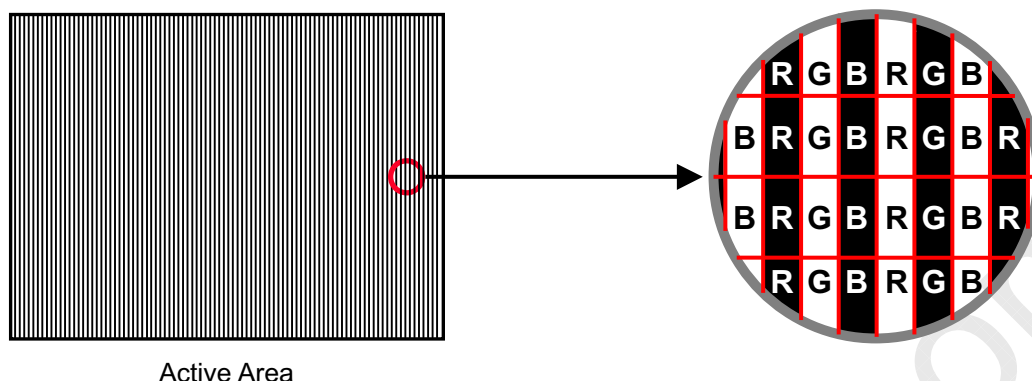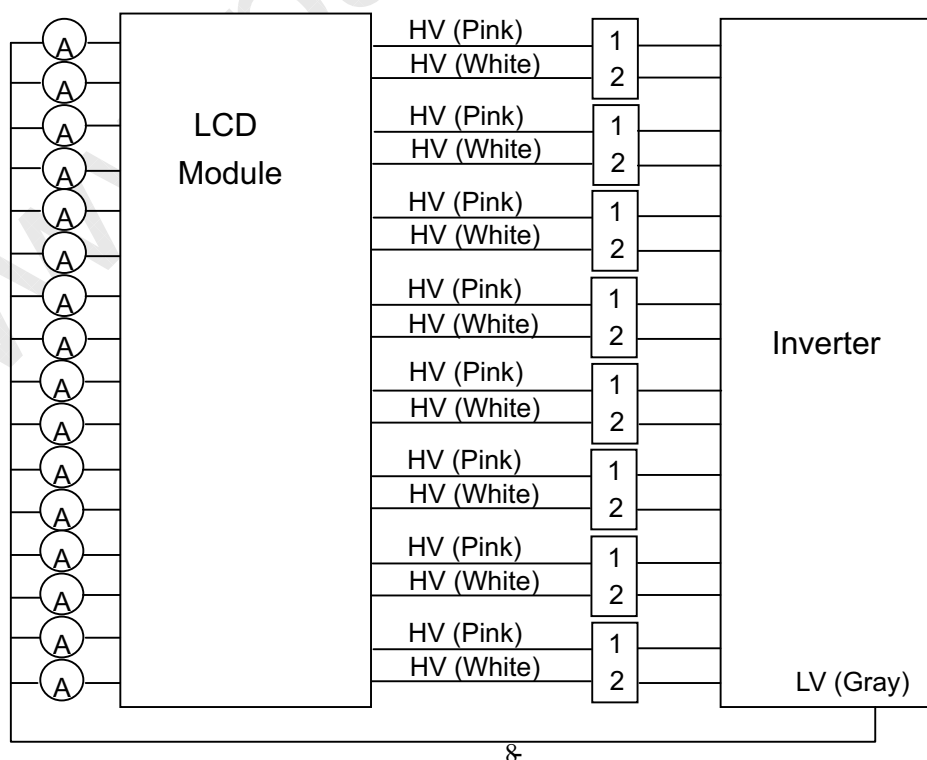| Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	106	-	W	(4), (7), I_L = 4.5mA
Input Voltage	V_{BL}	21.6	24	26.4	V_{DC}	
Lamp Voltage	V_W	1053	1170	1287	V_{RMS}	I_L = 4.5mA
Lamp Current	I_L	4.2	4.5	4.8	mA_{RMS}	(1)
Open Lamp Voltage	V_S	1560	-	3000	V_{RMS}	(2), Ta = 25 ºC
		1870	-	3000	V_{RMS}	(2), Ta = 0 ºC
Oscillating Frequency	F_W	57	60	63	KHz	(3)
Lamp Life Time	L_{BL}	50K	-	-	Hrs	(5)

Note (1) Lamp current is measured by utilizing high frequency current meters as shown below:

LCD Module

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)
HV (White)

Inverter

LV (Gray)

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval

Note (2) The open lamp 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 from the display, and this may cause 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 (5) The life time of a lamp is defined as the time in which it continues to operate under the condition Ta = 25 $\pm 2°C$ and I_L = 4.2 ~ 4.8 mArms until one of the following events occurs:

(a) When the brightness becomes equal or less than 50% of its original value.

(b) When the effective discharge length becomes equal or lower than 80% of its original value. (Effective discharge length is defined as an area that has equal or more than 70% brightness compared to the brightness at the center point.)

Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

Note (7) The power source capacity should be 3 times of inverter total power consumption P_{BL} or higher, and add an 0.1uf ceramic capacitor and an 1000uf aluminum capacitor or equivalent which should be paralleled between V_{BL} and ground of input connector in case of inverter malfunction.

Note (8) Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp, are following. It shall help increase the lamp lifetime and reduce leakage current.

a. The asymmetry rate of the lamp current waveform should be less than 5%.

b. The crest factor of lamp current waveform should be within 1.414 to 1.7.

c. Inverter output waveform had better be more similar to ideal sine wave.

9

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval

3.2.2 Interface Characteristics

ITEM		SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT	NOTE[2-4]
On/Off Control Voltage	ON	V_{BLON}	—	2.0	—	5.0	V	See Fig.2
	OFF		—	0	—	0.8	V	
Internal/External PWM Select Voltage	HI	V_{SEL}	—	2.0	—	5.0	V	Ext. Dim. Control
	LO		—	0	—	0.8	V	Int. Dim. Control
Internal PWM Control Voltage	MAX	V_{IPWM}	V_{SEL} = L	—	—	3.0	V	Minimum Duty Ratio
	MIN		V_{SEL} = L	—	0	—	V	Maximum Duty Ratio
External PWM Control Voltage	HI	V_{EPWM}	V_{SEL} = H	2.0	—	5.0	V	ON Duration
	LO		V_{SEL} = H	0	—	0.8	V	OFF Duration
Control Signal Rising Time		Tr	—	—	—	100	ms	See Fig.2
Control Signal Falling Time		Tf	—	—	—	100	ms	
PWM Signal Rising Time		T_{PWMR}	—	—	—	50	us	
PWM Signal Falling Time		T_{PWMF}	—	—	—	50	us	
Interface Impedance		R_{IN}	—	1	—	—	MΩ	Parallel in (Note 1)
				—	—	0.5	KΩ	Serial in (Note 1)
BLON Delay Time		T_{on}	—	500	—	—	mS	(Note 5)
BLON Off Time		T_{OFF}	—	500	—	—	mS	

Note (1) Permanent damage to the device may occur if interface impedance are exceeded above definition.

Note (2) All the interface circuits without spike suppress component hence the hot plug in or plug out of all connectors are inhibited.

Note (3) External PWM control signal (E_PWM) should be connected to low in case internal PWM was selected. (SEL = low). Internal PWM control signal (I_PWM) should be connected to ground in case external PWM was selected. (SEL = high), Floating of any control signal is not allowed.

Note (4) For dimming control function operation chart was shown as below.

Note (5) The power on sequence was defined as following. Before BLON signal raised, the input power V_{BL} shall maintain a BLON Delay Time (T_{on}) time in advance.

10

Approval
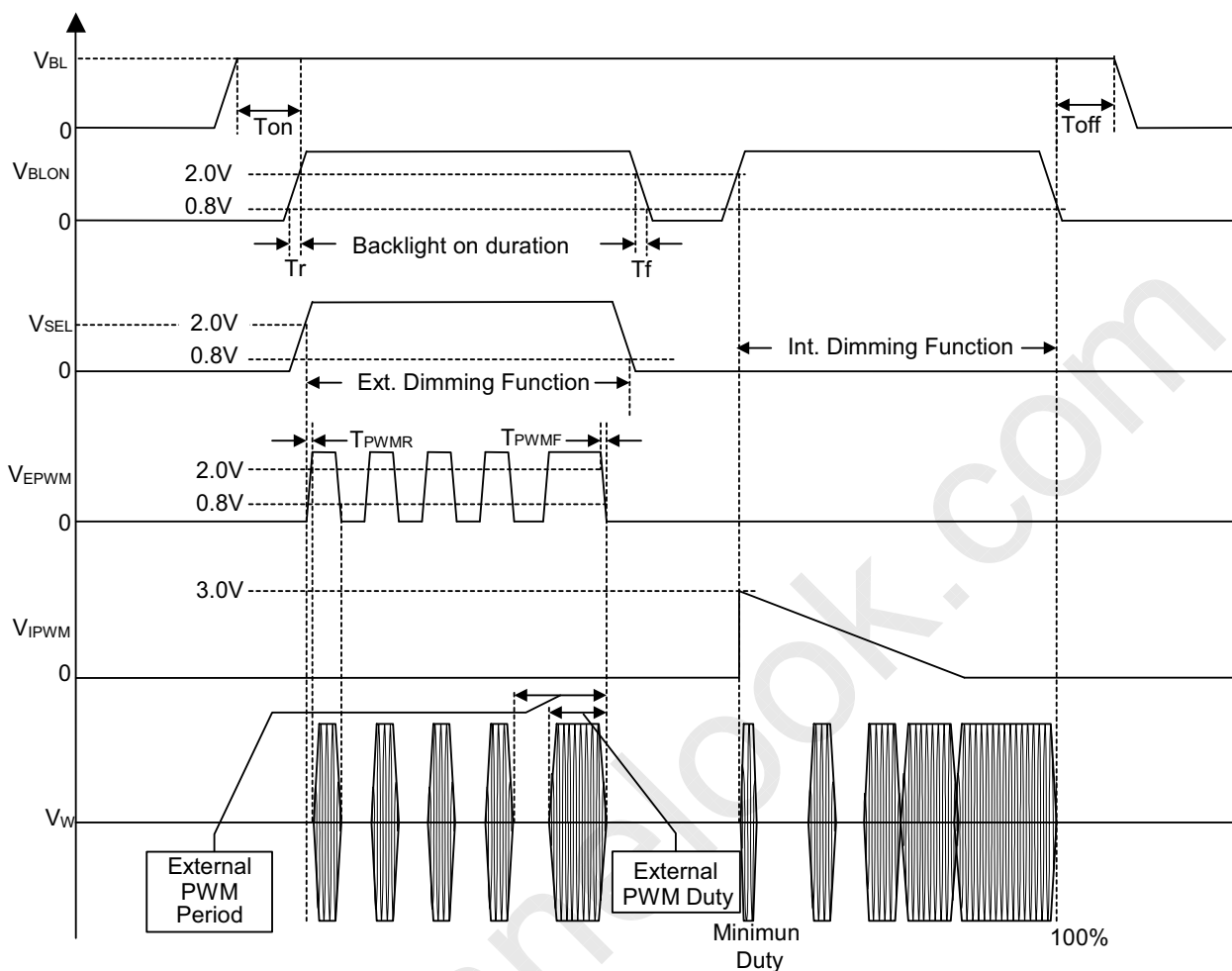
4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

CHI MEI
OPTOELECTRONICS CORP.

Approval
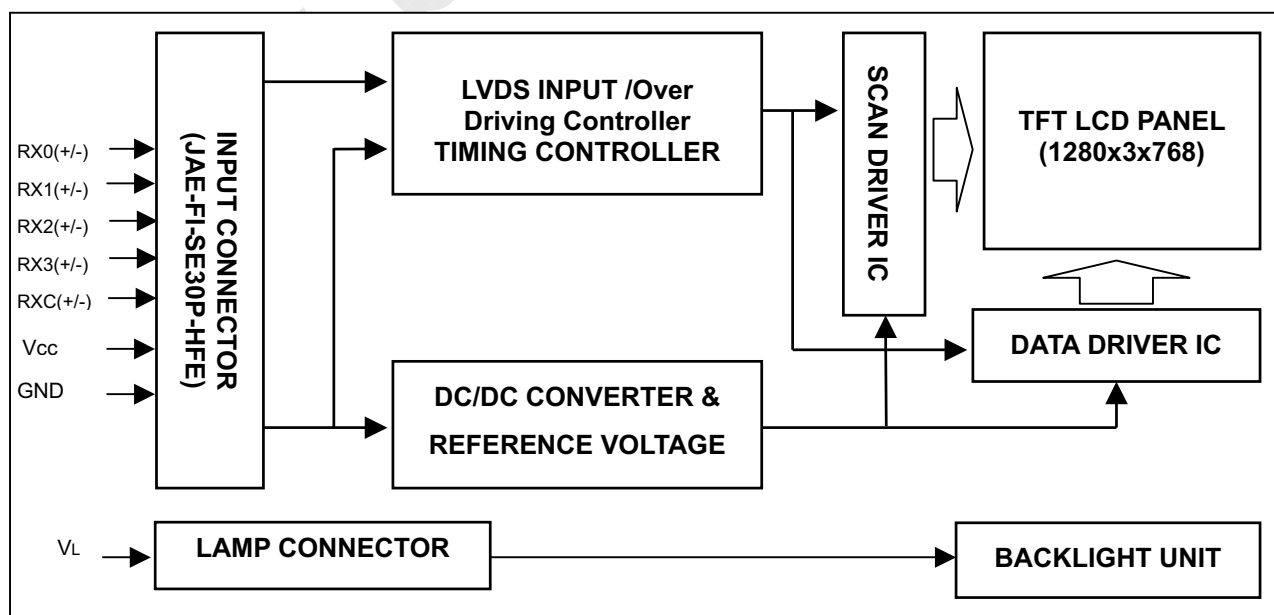
5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description
1	NC	No Connection
2	NC	No Connection
3	NC	No Connection
4	NC	No Connection
5	NC	No Connection
6	NC	No Connection
7	NC	No Connection
8	GND	Ground
9	RX3+	Positive LVDS differential data input. Channel 3
10	RX3-	Negative LVDS differential data input. Channel 3
11	RXCLK+	Positive LVDS differential clock input.
12	RXCLK-	Negative LVDS differential clock input.
13	GND	Ground
14	GND	Ground
15	RX2+	Positive LVDS differential data input. Channel 2
16	RX2-	Negative LVDS differential data input. Channel 2
17	RX1+	Positive LVDS differential data input. Channel 1
18	RX1-	Negative LVDS differential data input. Channel 1
19	RX0+	Positive LVDS differential data input. Channel 0
20	RX0-	Negative LVDS differential data input. Channel 0
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	VCC	+5.0V power supply
27	VCC	+5.0V power supply
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply

Note (1) Connector Part No.: FI-SE30P-HFE (JAE)

Note (2) The first pixel is even.

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1   - L14

Approval

5.2 BACKLIGHT UNIT

The pin configuration for the connector is shown in the table below.

CN3-CN10: BHR-03-VS-1

Pin №	Signal name	Feature	Wire Color
1	HV	High Voltage	Pink
2	HV	High Voltage	White

Note (1) The backlight interface connector for high voltage side is a model BHR-03VS-1, manufactured by JST.

The mating connector on inverter part number is SM02(8.0)B-BHS-1-TB(LF) or equivalent.

CN11: ZHR-2 or equivalent

Pin №	Signal name	Feature	Wire Color
1	LV	Low Voltage	Gray
2	NC	No Connection	-

Note (2) The backlight interface connector for low voltage side is a model ZHR-2, manufactured by JST or

equivalent. The mating connector on inverter part number is S2B-ZR-SM4A-TF(LF) or equivalent.

1 LV(Gray)

1 HV(Pink)

2 HV(White)

8 female connectors
BHR-03-VS-1 (JST)

1 HV(Pink)

2 HV(White)

1 HV(Pink)

2 HV(White)

13

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval
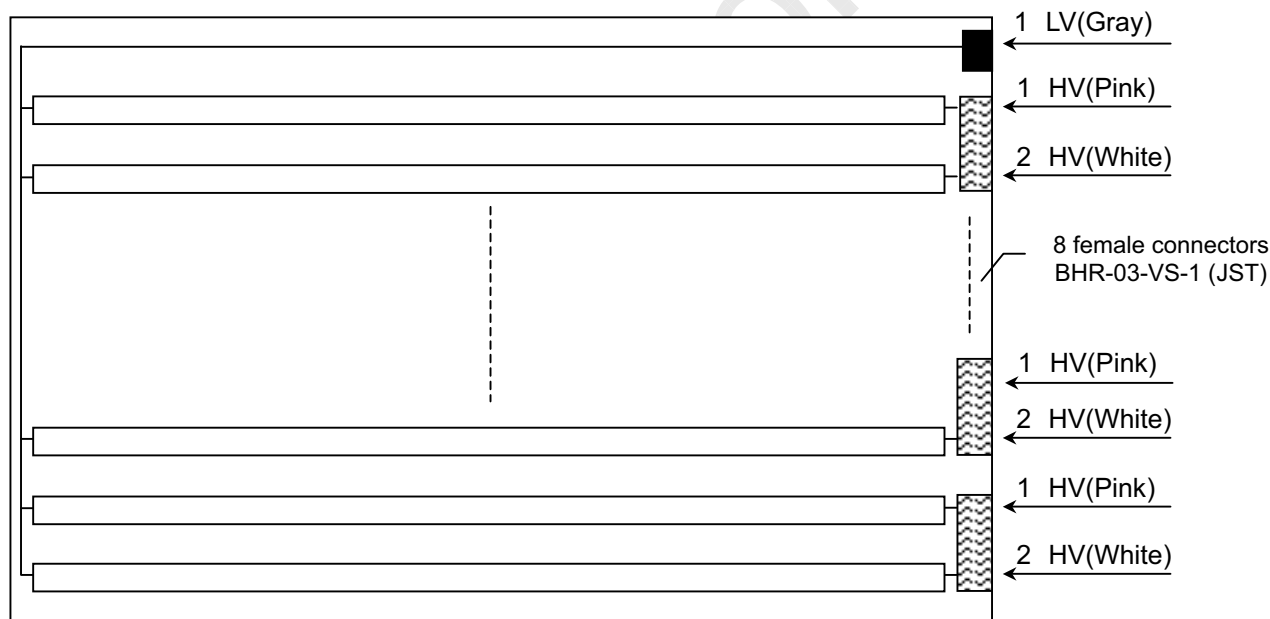
5.3 INVERTER UNIT

Note (1). The inverter input power source connector CN1 is a model S10B- PH-SM3-TB(D)(LF), manufactured by JST or equivalent. The inverter interface connector CN2 for control signal is a model S12B-PH-SM3-TB(D)(LF), manufactured by JST or equivalent.

CN1:S10B- PH-SM3-TB(D)(LF) or equivalent

Pin №	Signal name	Feature
1	V_{BL}	+24 V
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		

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

Pin №	Signal name	Feature
1	V_{BL}	+24 V
2		
3		
4		
5		
6	GND	GND
7		
8		
9	SEL	Internal/External PWM Selection
10	E_PWM	External PWM Control
11	I_PWM	Internal PWM Control
12	BLON	BL ON/OFF

CN3~10: SM02(8.0)B-BHS-1-TB(LF)(JST)

Pin №	Signal name	Feature
1	CFL HOT	CFL High voltage
2	CFL HOT	CFL High voltage

CN11: S2B-ZR-SM4A-TF(LF)(JST)or equivalent

Pin №	Signal name	Feature
1	CFL COLD	CFL Low voltage
2	CFL COLD	CFL Low voltage

14

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval

5.4 BLOCK DIAGRAM OF INTERFACE

CNF1
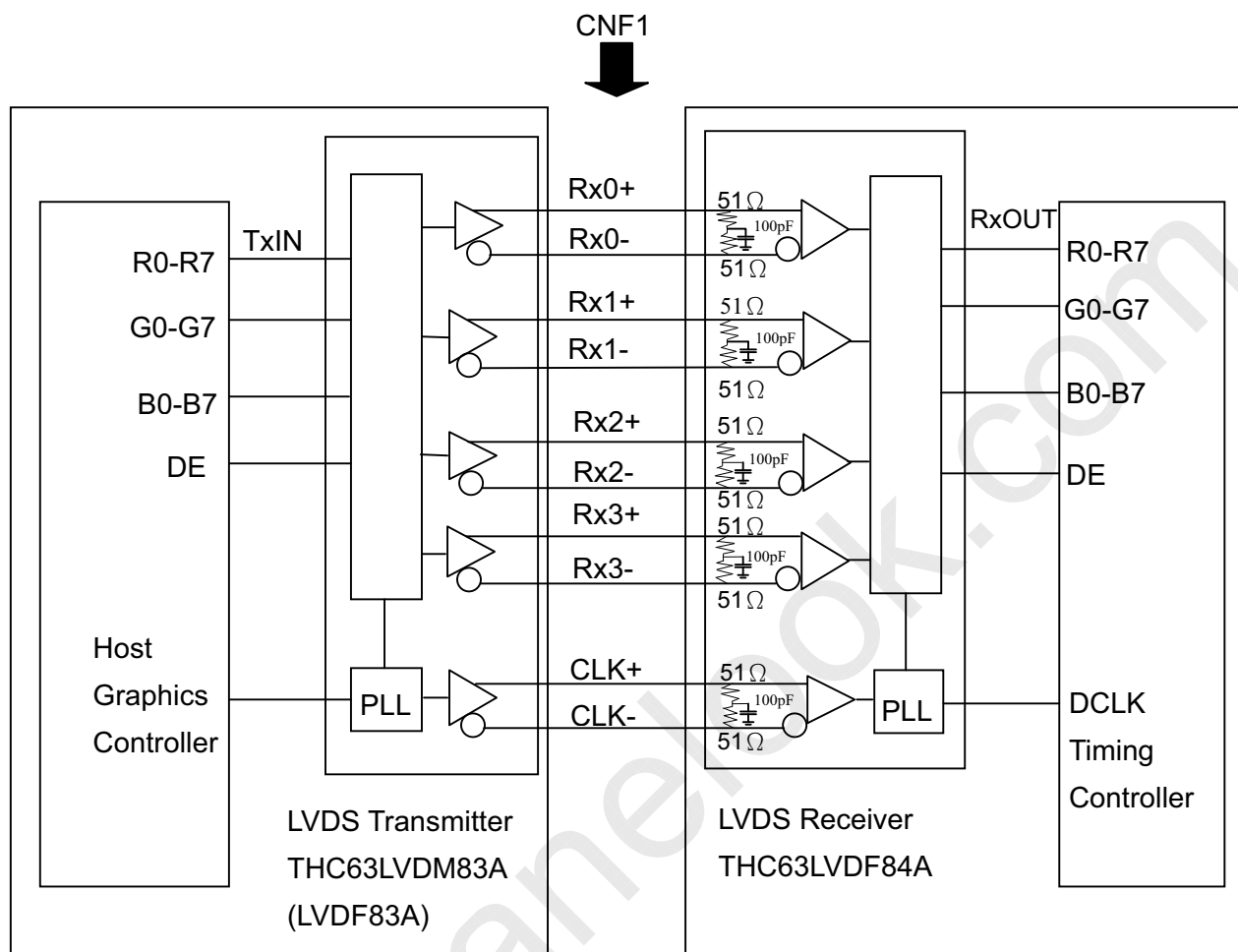
R0~R7   : Pixel R Data   ,
G0~G7   : Pixel G Data   ,
B0~B7   : Pixel B Data   ,
DE   : Display timing signal

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.

15

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1   - L14

Approval

5.5 LVDS INTERFACE

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER THC63LVDF84A		TFT CONTROL INPUT
		PIN	INPUT	Host	TFT-LCD	PIN	OUTPUT	
24bit	R0	51	TxIN0			27	Rx OUT0	R0
	R1	52	TxIN1			29	Rx OUT1	R1
	R2	54	TxIN2	TA OUT0+	Rx 0+	30	Rx OUT2	R2
	R3	55	TxIN3			32	Rx OUT3	R3
	R4	56	TxIN4			33	Rx OUT4	R4
	R5	3	TxIN6	TA OUT0-	Rx 0-	35	Rx OUT6	R5
	G0	4	TxIN7			37	Rx OUT7	G0
	G1	6	TxIN8			38	Rx OUT8	G1
	G2	7	TxIN9			39	Rx OUT9	G2
	G3	11	TxIN12	TA OUT1+	Rx 1+	43	Rx OUT12	G3
	G4	12	TxIN13			45	Rx OUT13	G4
	G5	14	TxIN14			46	Rx OUT14	G5
	B0	15	TxIN15	TA OUT1-	Rx 1-	47	Rx OUT15	B0
	B1	19	TxIN18			51	Rx OUT18	B1
	B2	20	TxIN19			53	Rx OUT19	B2
	B3	22	TxIN20			54	Rx OUT20	B3
	B4	23	TxIN21	TA OUT2+	Rx 2+	55	Rx OUT21	B4
	B5	24	TxIN22			1	Rx OUT22	B5
	DE	30	TxIN26			6	Rx OUT26	DE
	R6	50	TxIN27	TA OUT2-	Rx 2-	7	Rx OUT27	R6
	R7	2	TxIN5			34	Rx OUT5	R7
	G6	8	TxIN10			41	Rx OUT10	G6
	G7	10	TxIN11			42	Rx OUT11	G7
	B6	16	TxIN16	TA OUT3+	Rx 3+	49	Rx OUT16	B6
	B7	18	TxIN17			50	Rx OUT17	B7
	RSVD 1	25	TxIN23			2	Rx OUT23	Not connect
	RSVD 2	27	TxIN24	TA OUT3-	Rx 3-	3	Rx OUT24	Not connect
	RSVD 3	28	TxIN25			5	Rx OUT25	Not connect
	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   : Display timing signal

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

16

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1   - L14

Approval

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 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

17

DCC No.:24044112
Issued Date: Dec. 31, 2004
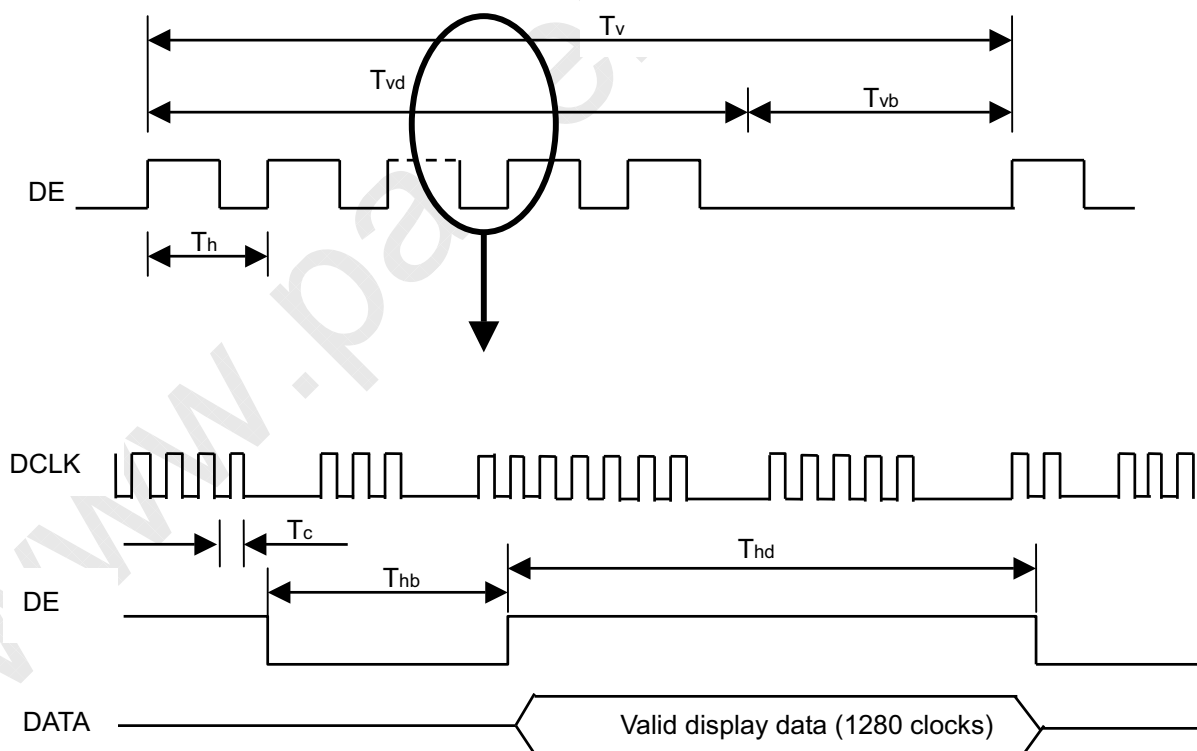Model No.: V296W1   - L14

Approval

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

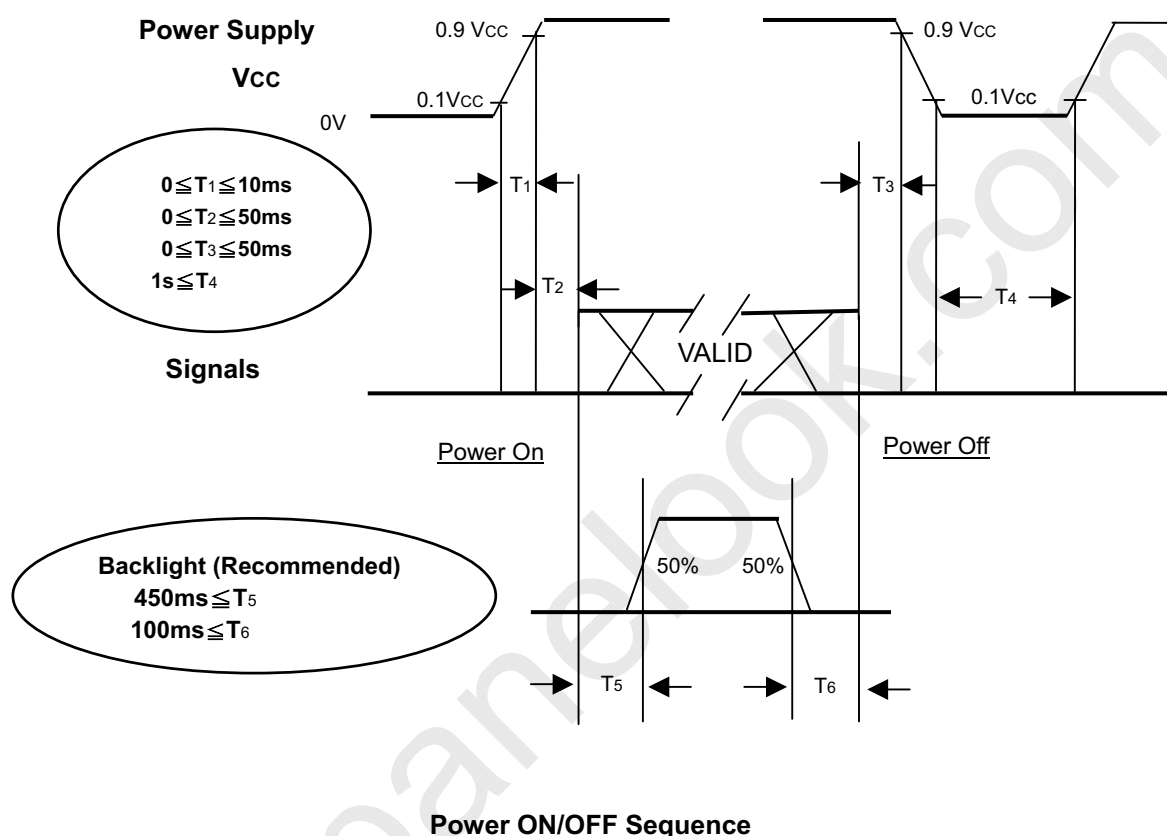| Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Clock	Frequency	1/Tc	62	81	82	MHZ	-
Vertical Active Display Term	Frame Rate	Fr	-	60	64	Hz	Tv=Tvd+Tvb
	Total	Tv	780	806	850	Th	-
	Display	Tvd	768	768	768	Th	-
	Blank	Tvb	12	38	82	Th	-
Horizontal Active Display Term	Total	Th	1450	1688	2000	Tc	Th=Thd+Thb
	Display	Thd	1280	1280	1280	Tc	-
	Blank	Thb	170	408	720	Tc	-

Note: Because of this module is operated by DE only mode, Hsync and Vsync input signals should be set

to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval

6.2 POWER ON/OFF SEQUENCE

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

Power Supply
Vcc

0.9 Vcc
0.1Vcc
0V

0≦T$_1$≦10ms
0≦T$_2$≦50ms
0≦T$_3$≦50ms
1s≦T$_4$

Signals

0.9 Vcc
0.1Vcc

T$_1$ T$_3$
T$_2$ T$_4$

VALID

Power On   Power Off

Backlight (Recommended)
450ms≦T$_5$
100ms≦T$_6$

50% 50%

T$_5$ T$_6$

Power ON/OFF Sequence

Note.

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

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

(3) In case of VCC = off level, please keep the level of input signals on the low or keep a 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.

Approval

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

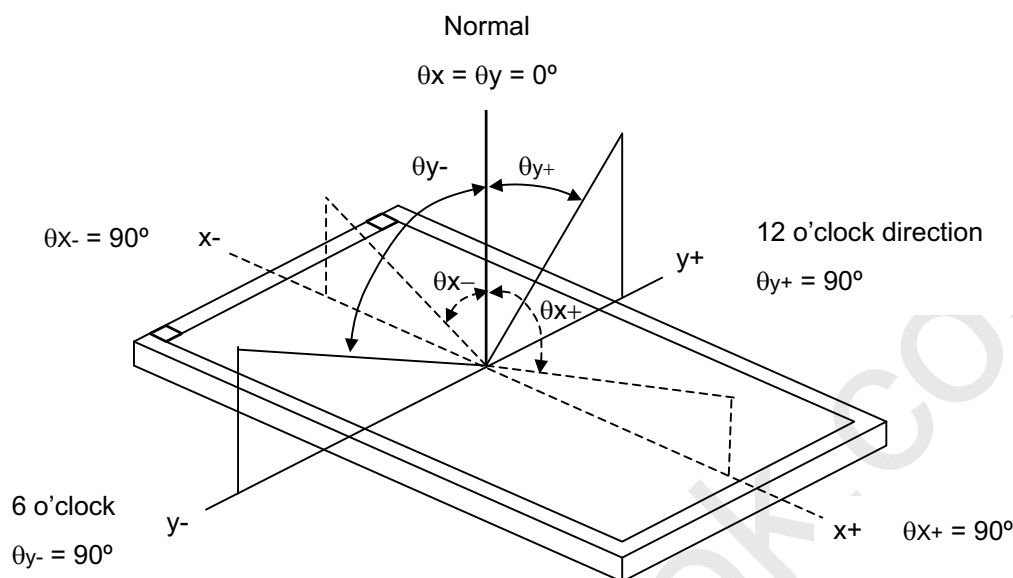| Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	^{o}C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	4.5	mA
Inverter Driving Frequency	F_L	60	KHz
Inverter	--		

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		600	800	-	-	Note(2)
Response Time		Gray to gray			8	12	ms	Note(3)
Center Luminance of White		L_C		450	550	-	cd/m^2	Note(4)
Average Luminance of White		L_{AVE}		400	450	-	cd/m^2	Note(4)
White Variation		δW		-	-	1.3	-	Note(7)
Cross Talk		CT		-	-	4.0	%	Note(5)
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing Normal Angle	0.614	0.644	0.674	-	Note(6)
		Ry		0.301	0.331	0.361	-	
	Green	Gx		0.240	0.270	0.300	-	
		Gy		0.574	0.604	0.634	-	
	Blue	Bx		0.112	0.142	0.172	-	
		By		0.044	0.074	0.104	-	
	White	Wx		0.255	0.285	0.315	-	
		Wy		0.263	0.293	0.323	-	
	Color Gamut	CG		72	75		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥10	80	85	-	Deg.	Note(1)
		θ_x-		80	85	-		
	Vertical	θ_Y+		80	85	-		
		θ_Y-		80	85	-		

2θ

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

Approval

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)

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

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

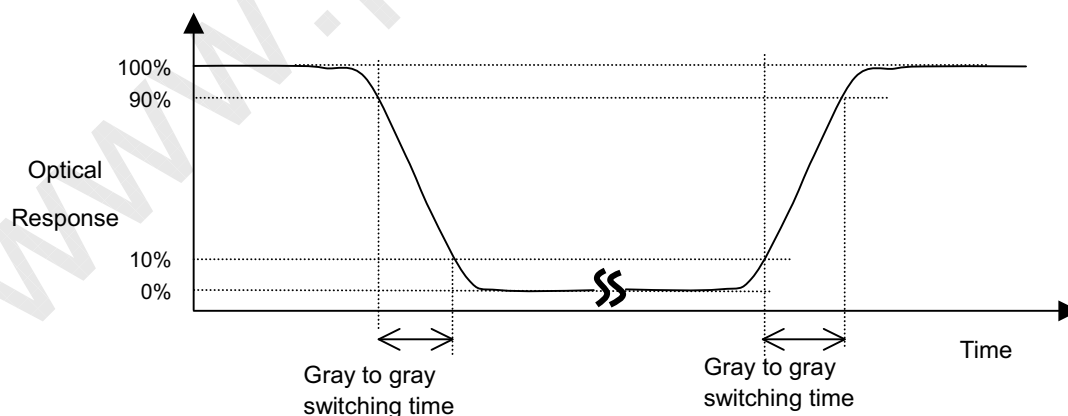L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (8).

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

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

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

21

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1   - L14

Approval

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

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

$L_C = L (5)$

$L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5$

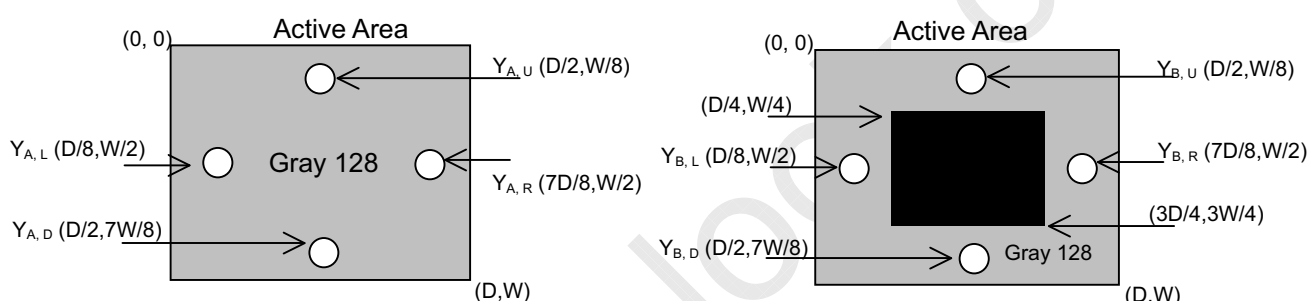L (x) is corresponding to the luminance of the point X at the figure in Note (8).

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

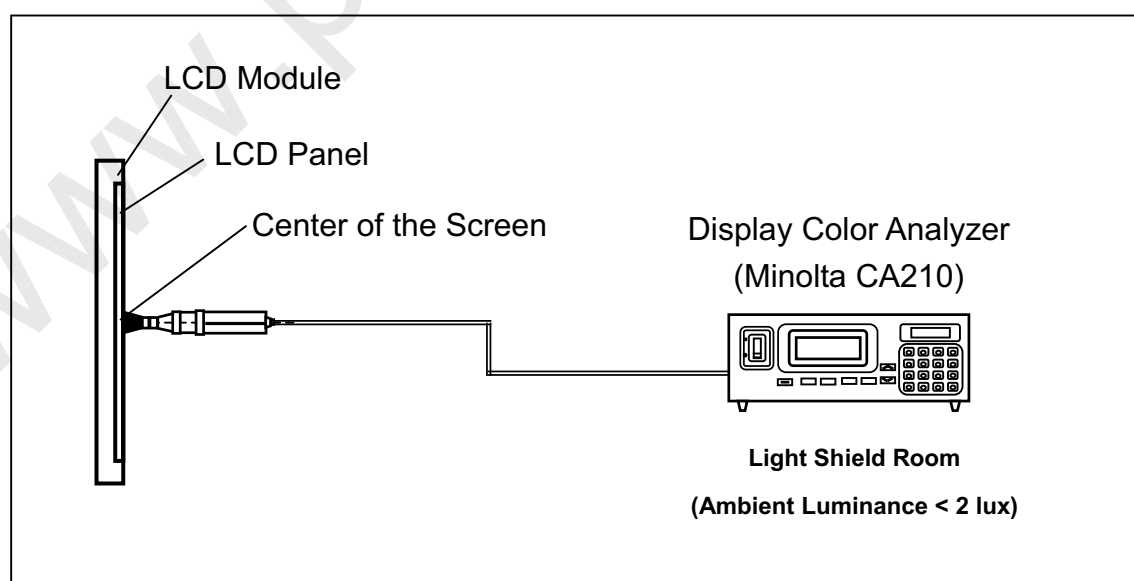$CT = | Y_B - Y_A | / Y_A \times 100 (\%)$

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.

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1   - L14

Approval

Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = 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

23

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.1**

CHI MEI OPTOELECTRONICS CORP.

Approval
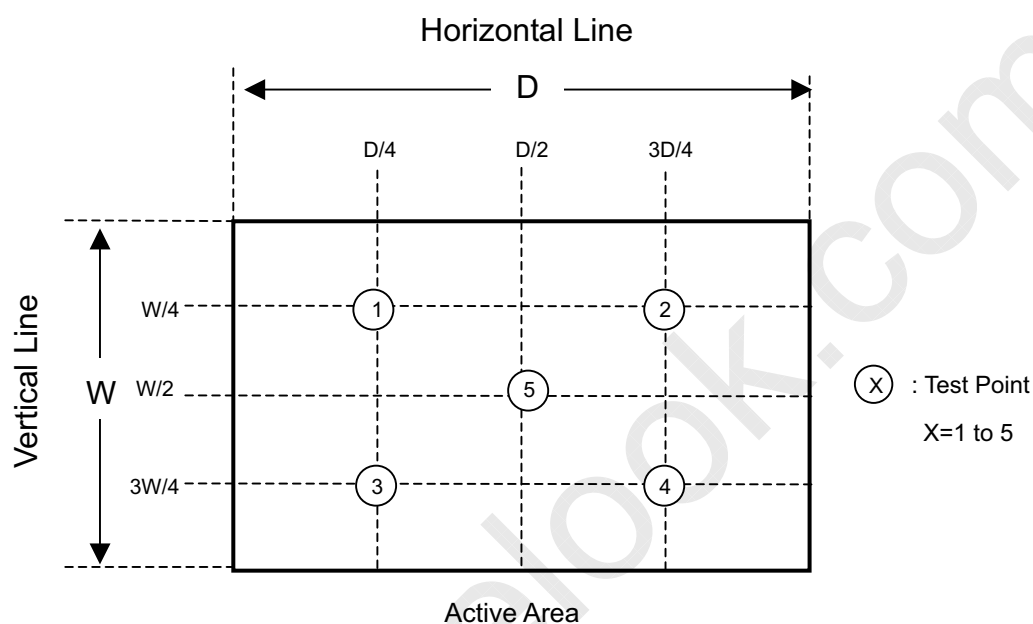
8. PACKAGING

8.1 PACKING SPECIFICATIONS

(1) 3 LCD TV modules / 1 Box

(2) Box dimensions : 790(L) X 280 (W) X 564 (H)

(3) Weight : approximately 19Kg (3 modules per box)

8.2 PACKING Method

Figures 8-1 and 8-2 are the packing method

LCD TV Module

Carton dimensions: 790(L)x280(W)x564(H)mm
Weight ：Approx.19Kg(3modules per 1 carton)

Anti-static Bag

PE Foam(Bottom)

PE Foam(Top)

Drier

Carton

Carton Label

Figure.8-1 packing method

24

Approval
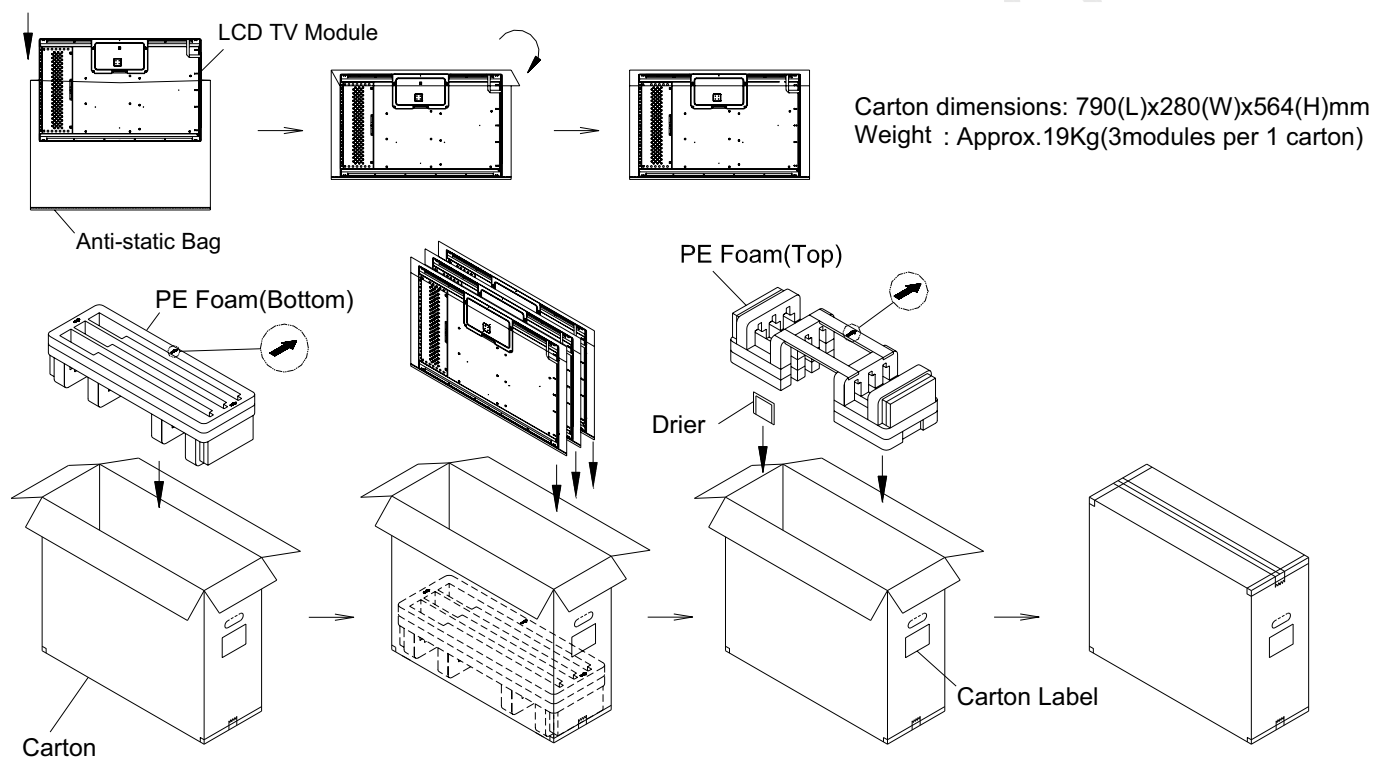
Corner Protector:L1130*50mm*50mm

Pallet:L1100*W1100*H135mm

Corrugated Fiberboard:L1100*W1100mm
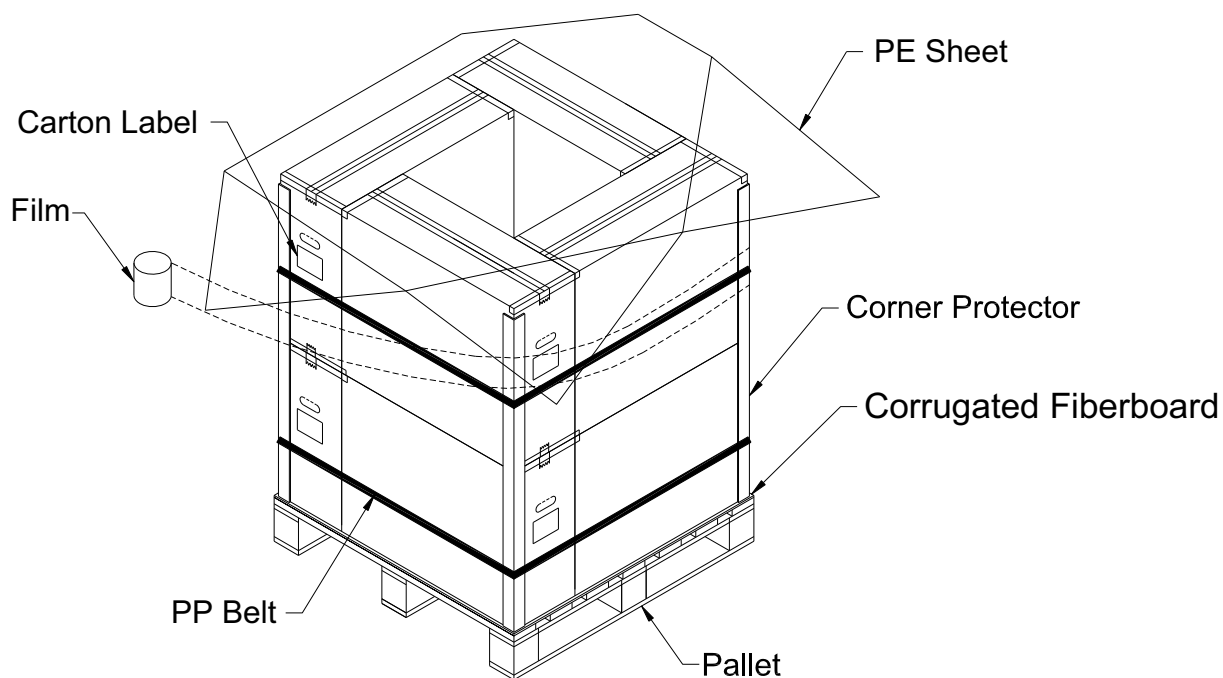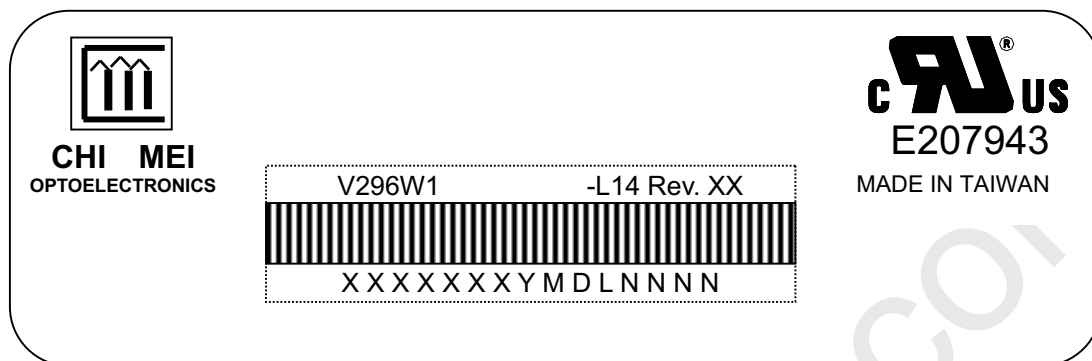
Pallet Stack:L1100*W1100*H1273mm

Gross:175kg
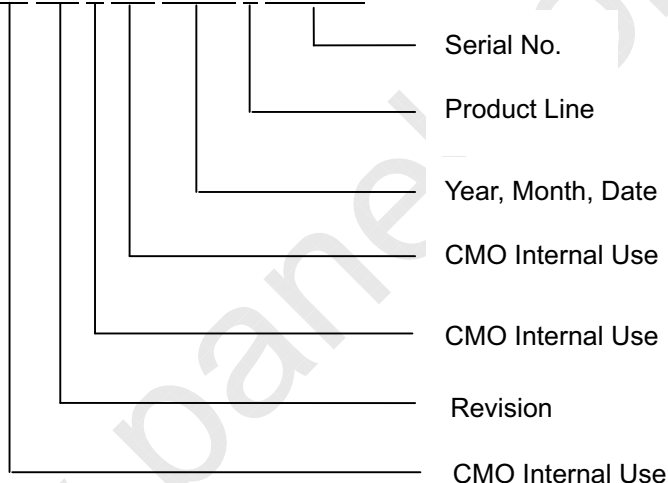

Figure. 8-2 Packing method

25

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1　　- L14

Approval

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: V296W1-L14

(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: 1~9, 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.

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.　　**Version 2.1**

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1   - L14

Approval

10. PRECAUTIONS

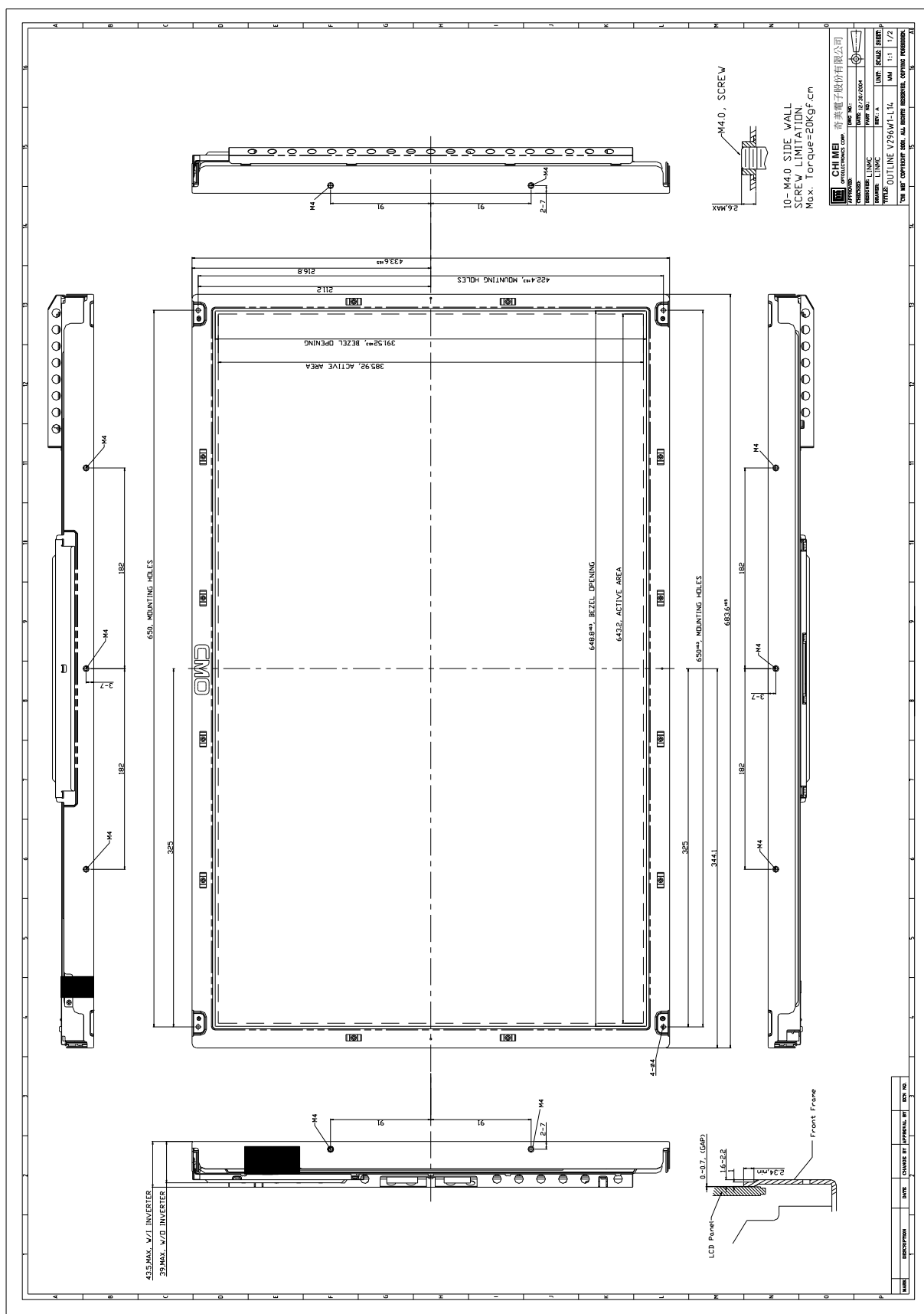### 10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(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 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.

10.2 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.

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1　　- L14

Approval

11. MECHANICAL CHARACTERISTICS

28

The information described in this technical specification is tentative and it is possible to be changed without prior notice.

Please contact CMO 's representative while your product design is based on this specification.　　**Version 2.1**

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1　- L14

Approval

29

The information described in this technical specification is tentative and it is possible to be changed without prior notice.

Please contact CMO 's representative while your product design is based on this specification.　　Version 2.1

DCC No.:24044112
Issued Date: Dec. 31, 2004
Model No.: V296W1　　- L14

Approval

NOTES:
1.MATERIAL : FR-4, UL94-V0.
2.THICKNESS : 1.2mm.
3.COMPONENT HEIGHT LIMITATION IS 7.9mm, UNLESS OTHERWISE INDICATED.
4.▨ : GND.
5.GENERAL TOLERANCE IS 0.2mm.
6.ALL FILLET RADIUS IS 1.0mm.

COMPONENT SIDE

BACK SIDE (NO COMPONET)

CHI MEI OPTOELECTRONICS CORP.　奇美電子股份有限公司
DWG NO.: V296126112
DATE: 12/30/04
PART NO.:
APPROVED:
CHECKED:
DESIGNER: LINMC
DRAWER: LINMC
REV.: 2
TITLE: PCB INVERTER V296W1
UNIT: MM
SCALE: 1:1
SHEET: 1/1

"CHI MEI" COPYRIGHT 2001. ALL RIGHTS RESERVED, COPYING FORBIDDEN.

MARK | DESCRIPTION | DATE | CHANGE BY | APPROVAL BY | ECN NO.

3θ

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification. **Version 2.1**