

TFT LCD Approval Specification

MODEL NO.: V260B3 – L05

Customer: _____ Approved by: _____ Note:
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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver. 2.0	Dec. 16,'09	All	All	Approval Specification was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V260B3- L05 is a 26" TFT Liquid Crystal Display module with 4U-CCFL Backlight unit and 1ch-LVDS interface. This module supports 1366 x 768 WXGA format and can display 16.7M (8-bit/color) colors. The inverter module for backlight is built-in.

1.2 FEATURES

- Optimized Brightness 450nits
- Contrast Ratio (3000:1)
- Fast Response Time (Gray to gray average 8.5ms)
- Color Saturation NTSC 72%
- WXGA (1366 x 768 pixels) Resolution
- DE (Data Enable) Only Mode
- LVDS (Low Voltage Differential Signaling) Interface
- Viewing Angle: 176(H)/176(V) (CR>20) MVA Technology
- Color Reproduction (Nature Color)

1.3 APPLICATION

- TFT LCD TVs
- Optimized Brightness, Multi-Media Displays

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	575.769 (H) x 323.712 (V) (26" diagonal)	mm	(1)
Bezel Opening Area	580.8 (H) x 328.8 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1366 x R.G.B. x 768	pixel	
Pixel Pitch (Sub Pixel)	0.1405 (H) x 0.4215 (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 11%) Hard Coating (3H)	-	

1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note	
Module Size	Horizontal(H)	625	626	627	mm	(1)
	Vertical(V)	372	373	374	mm	(1)
	Depth(D)	34	35	36	mm	To Rear
	Depth(D)	50.5	51.5	52	mm	To inverter cover
Weight	-	3700	-	g		

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

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(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. ($T_a \leq 40$ °C).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40$ °C).

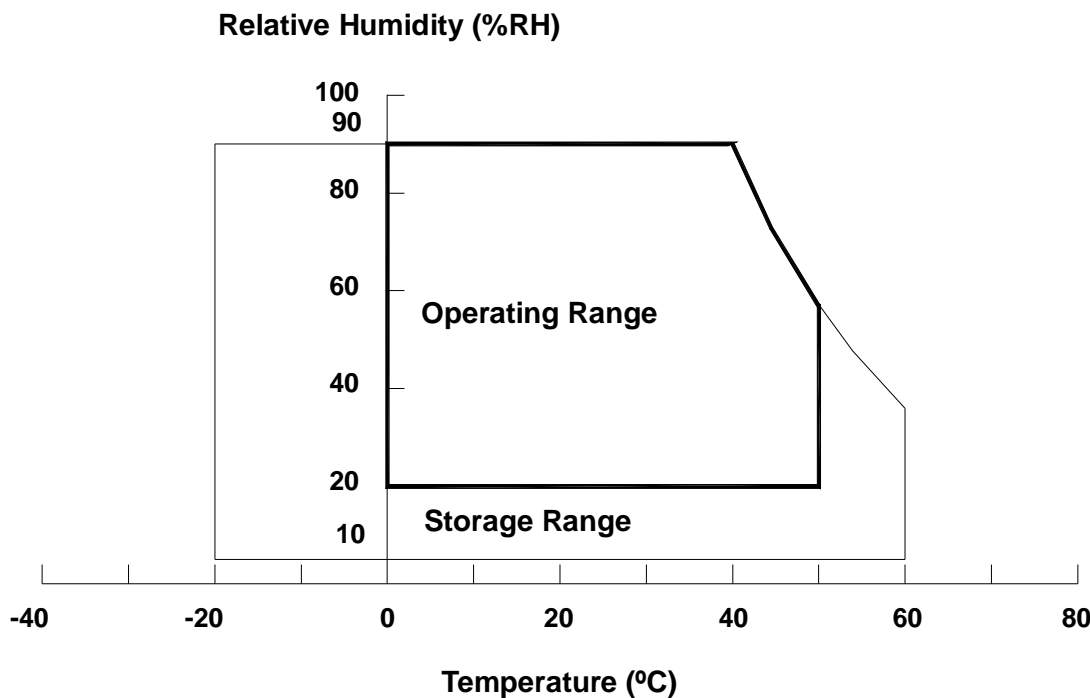
(c) No condensation.

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 °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 $\pm X$, $\pm Y$, $\pm Z$.

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.



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)
Input Signal Voltage	V _{IN}	-0.3	3.6	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Test Condition	Min.	Type	Max.	Unit	Note
Lamp Voltage	V _W	T _a = 25 °C	—	—	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. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) No moisture condensation or freezing.

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

3. ELECTRICAL CHARACTERISTICS

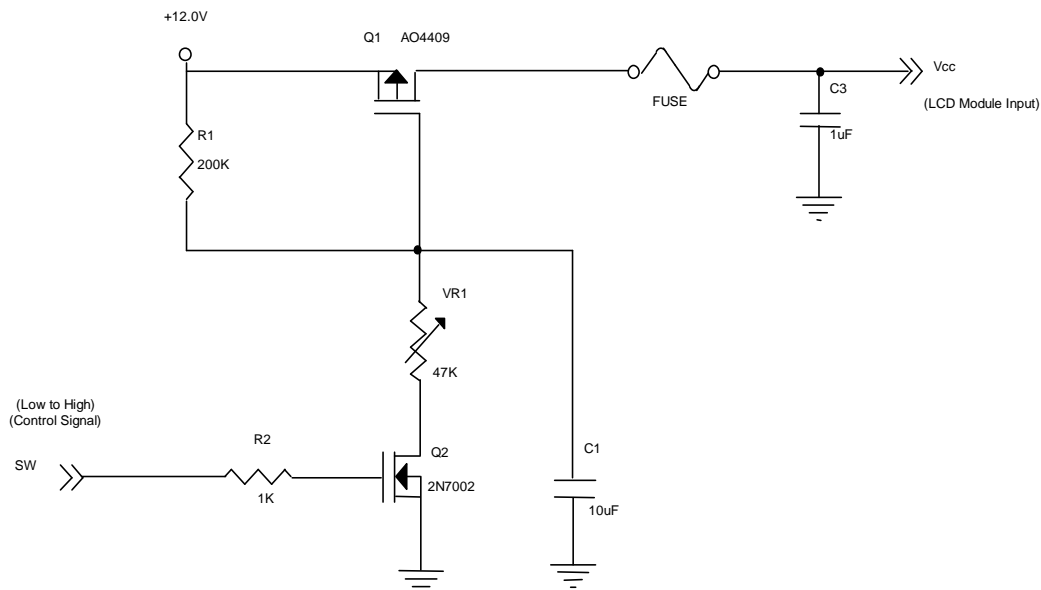
3.1 TFT LCD MODULE

Ta = 25 ± 2 °C

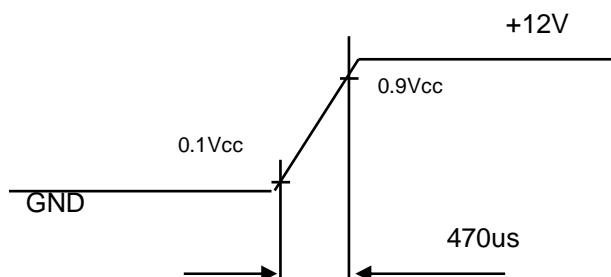
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V _{CC}	10.8	12.0	13.2	V	(1)
Rush Current		I _{RUSH}	—	—	3.0	A	(2)
Power Supply Current	White	I _{CC}	—	0.45	0.50	A	(3)
	Black		—	0.35	0.40	A	
	Vertical Stripe		—	0.45	0.50	A	
LVDS Interface	Differential Input High Threshold Voltage	V _{LVTH}	+100	—	—	mV	(4)
	Differential Input Low Threshold Voltage	V _{LVTL}	—	—	-100	mV	
	Common Input Voltage	V _{LVC}	1.0	1.2	1.4	V	
	Differential input voltage	V _{ID}	200	—	600	mV	
	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 above ranges.

Note (2) Measurement Conditions:



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



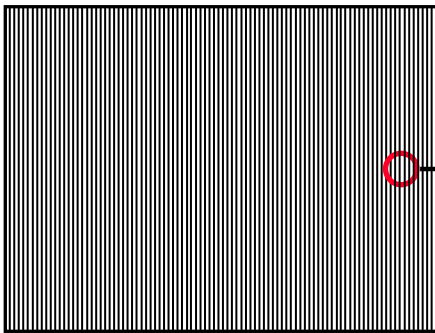
Active Area

b. Black Pattern

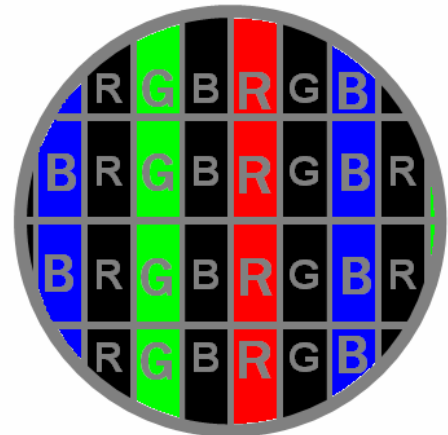


Active Area

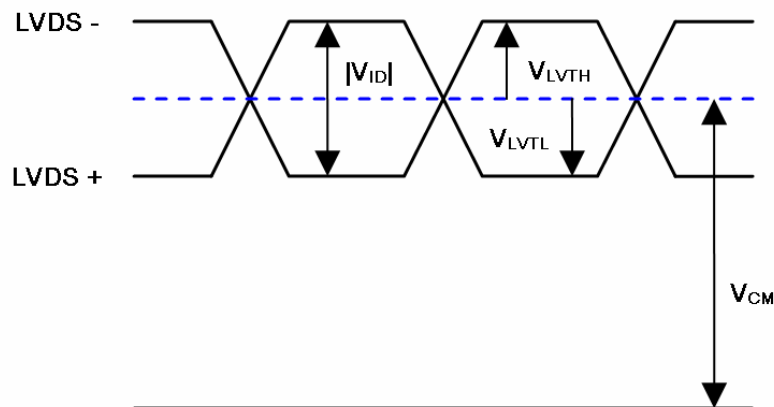
c. Vertical Stripe Pattern



Active Area



Note (4) The LVDS input characteristics are as follows:



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 _L	-	1340	-	V _{RMS}	
Lamp Current	I _L	9.5	10.0	10.5	mA _{RMS}	(1)
Lamp Turn On Voltage	V _S	-	-	2270	V _{RMS}	Ta = 0 °C (2)
		-	-	1890	V _{RMS}	Ta = 25 °C (2)
Operating Frequency	F _L	40	-	80	KHZ	
Lamp Life Time	L _{BL}	50,000	-	-	Hrs	(4)

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

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Total Power Consumption	P ₂₅₅	-	55	57	W	(5), (6), I _L = 10.0mA
Power Supply Voltage	V _{BL}	21.6	24	26.4	V _{DC}	
Power Supply Current	I _{BL}	-	2.29	2.38	A	Non Dimming
Input Ripple Noise	-	-	-	912	mV _{P-P}	V _{BL} = 22.8V
Oscillating Frequency	F _W	55	58	61	kHz	(3)
Dimming frequency	F _B	120	160	200	Hz	(7)
Minimum Duty Ratio	D _{MIN}	10	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.

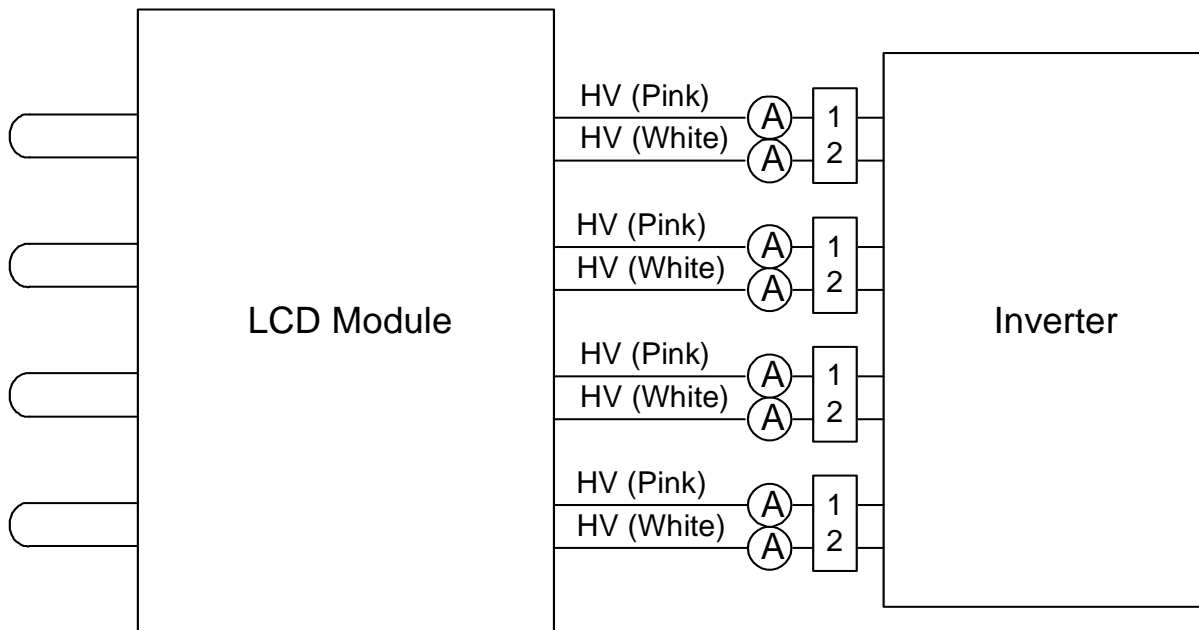
Note (3) The lamp frequency may produce interference with horizontal synchronous frequency of the display input signals, and it may result in line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as 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°C and I_L = 9.5~ 10.5mA_{RMS}.

Note (5) The power supply capacity should be higher than the total inverter power consumption P_{BL}. 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 26" backlight unit under input voltage 24V, average lamp current 10.3 mA and lighting 30 minutes later.

Note (7) 10% minimum duty ratio and dimming at 75Hz/5% are only valid for electrical operation.



3.2.3 INVERTER INTERFACE CHARACTERISTICS

Parameter	Symbol	Test Condition	Value			Unit	Note
			Min.	Typ.	Max.		
On/Off Control Voltage	ON	—	2.4	—	5.5	V	
	OFF		0	—	0.8	V	
Internal PWM Control Voltage	MAX	—	3.0	3.15	3.3	V	Maximum duty ratio
	MIN		—	0	—	V	Minimum duty ratio
External PWM Control Voltage	HI	—	2.4	—	5.5	V	Duty on
	LO		0	—	0.8	V	Duty off
Error Signal	ERR	—	Open Collector			V	Abnormal
			0	—	0.8		Normal
Error Turn on Delay Time	T_{ER-R}	—	—	—	200	ms	
Error Turn off Delay Time	T_{ER-F}	—	—	—	200	ms	
VBL Rising Time	T_{r1}	—	30	—	—	ms	10%-90% V_{BL}
VBL Falling Time	T_{f1}	—	30	—	—	ms	
Control Signal Rising Time	T_r	—	—	—	100	ms	
Control Signal Falling Time	T_f	—	—	—	100	ms	
PWM Signal Rising Time	T_{PWR}	—	—	—	50	us	
PWM Signal Falling Time	T_{PWF}	—	—	—	50	us	
Input impedance	R_{IN}	—	1	—	—	MΩ	
PWM Turn on Delay Time	T_{PWRON}	—	500	—	—	ms	
PWM Turn off Delay Time	T_{PWROFF}	—	1	—	—	ms	
BLON Turn on Delay Time	T_{on}	—	200	—	—	ms	
BLON Turn off Time	T_{off}	—	200	—	—	ms	
BLON Delay Time	T_{on1}	—	300	—	—	ms	

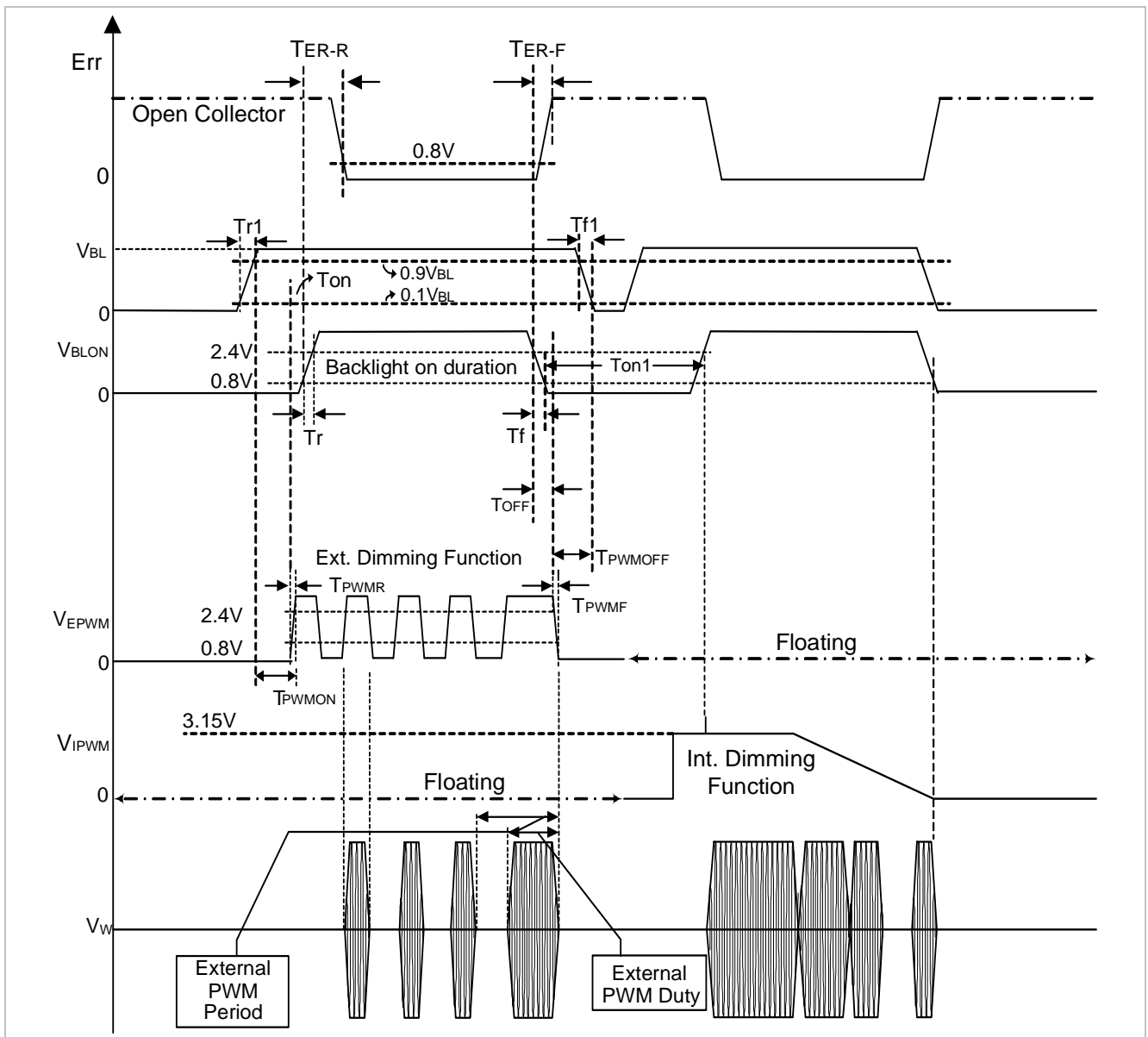
Note (1) The Dimming signal should be valid before backlight turns on by BLON signal. It is inhibited to change the internal/external PWM signal during backlight turn on period.

Note (2) The power sequence and control signal timing are shown in the following figure. For a certain reason, the inverter has a possibility to be damaged with wrong power sequence and control signal timing.

Note (3) While system is turned ON or OFF, the power sequences must follow as below descriptions:

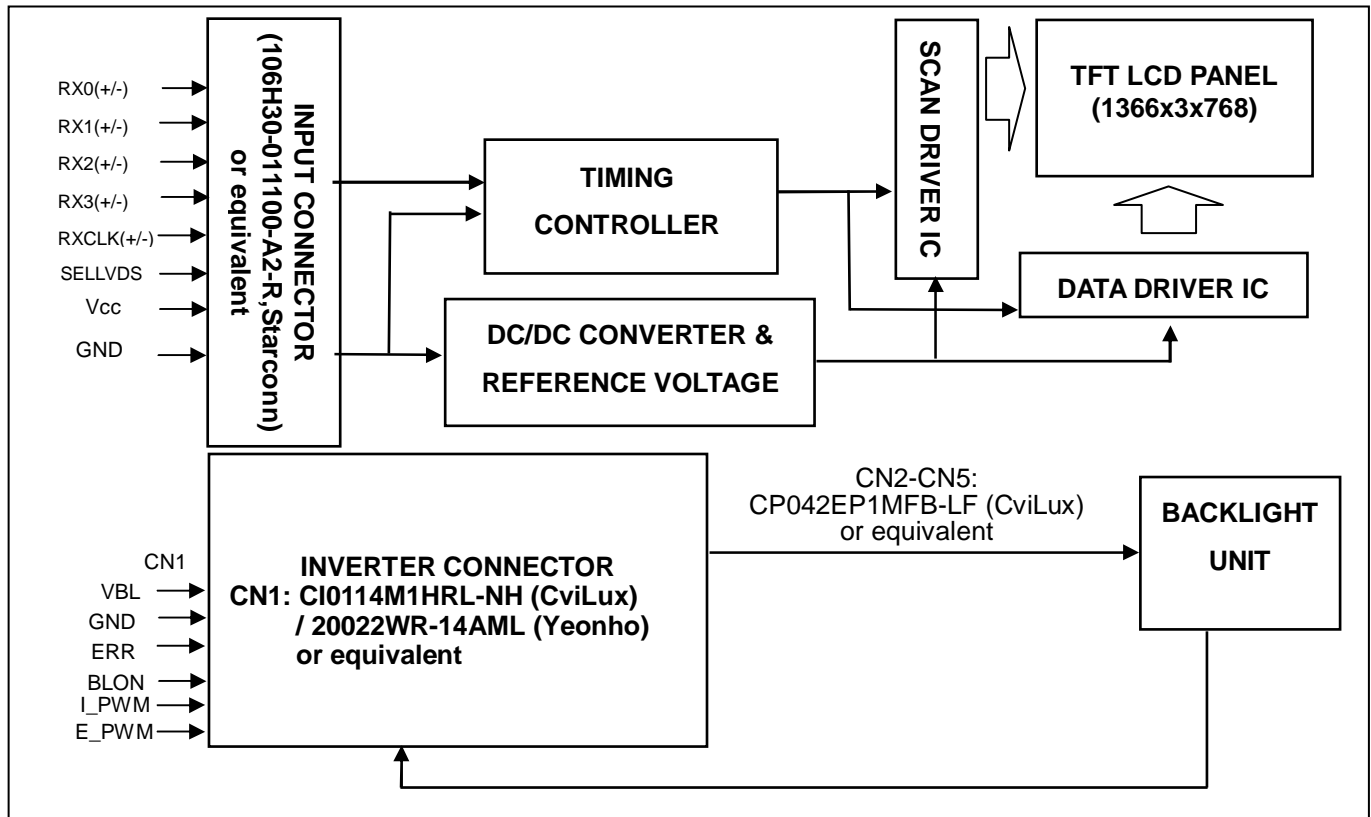
Turn ON sequence: VBL → PWM signal → BLON

Turn OFF sequence: BLOFF → PWM signal → VBL



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INTERFACE PIN CONNECTION

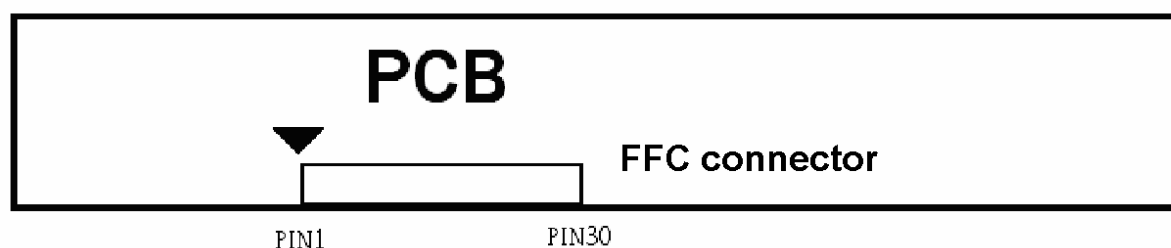
5.1 TFT LCD MODULE

CN1 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	NC	No connection	(3)
2	SCL	EEPROM Serial Clock	
3	SDA	EEPROM Serial Data	
4	GND	Ground	
5	RX0-	Negative transmission data of pixel 0	
6	RX0+	Positive transmission data of pixel 0	
7	GND	Ground	
8	RX1-	Negative transmission data of pixel 1	
9	RX1+	Positive transmission data of pixel 1	
10	GND	Ground	
11	RX2-	Negative transmission data of pixel 2	
12	RX2+	Positive transmission data of pixel 2	
13	GND	Ground	
14	RXCLK-	Negative of clock	
15	RXCLK+	Positive of clock	
16	GND	Ground	
17	RX3-	Negative transmission data of pixel 3	
18	RX3+	Positive transmission data of pixel 3	
19	GND	Ground	
20	PANEL_SEL	No connection	
21	SELLVDS	Select LVDS data format	(2),(4)
22	WP	EEPROM Write Protection	
23	GND	Ground	
24	GND	Ground	
25	NC	No connection	(3)
26	VCC	Power supply: +12V	
27	VCC	Power supply: +12V	
28	VCC	Power supply: +12V	
29	VCC	Power supply: +12V	
30	VCC	Power supply: +12V	

Note (1) Connector Part No.: Starconn, 106H30-011100-A2-R or compatible

LVDS connector pin order defined as follows



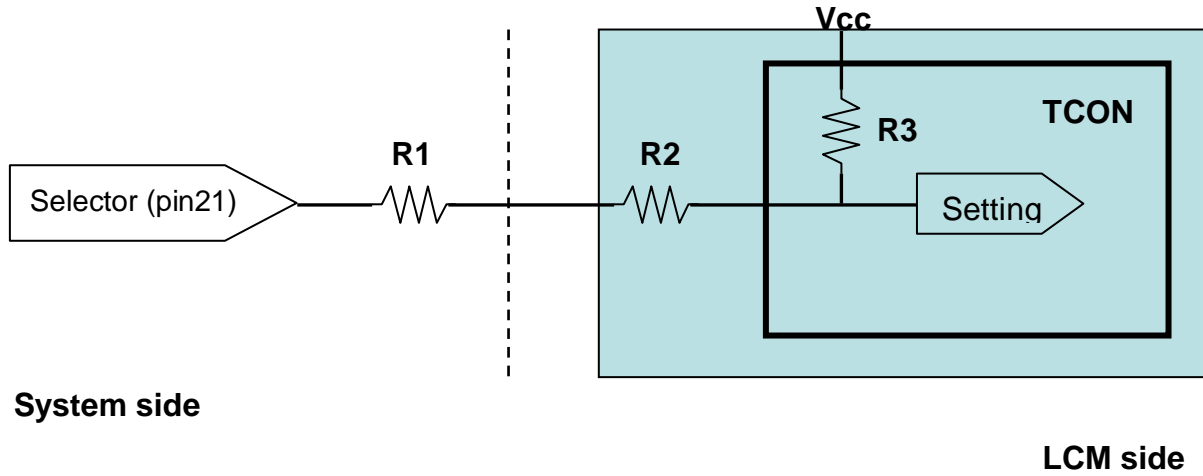
Note (2) High = Open or connect to +3.3V: VESA Format, Low = Connect to GND: JEIDA Format.

Please refer to 5.5 LVDS INTERFACE

Note (3) Reserved for internal use. Please leave it open.

Note (4) LVDS signal pin connected to the LCM side has the following diagram.

R1 in the system side should be less than 1K Ohm. ($R1 < 1K \text{ Ohm}$)



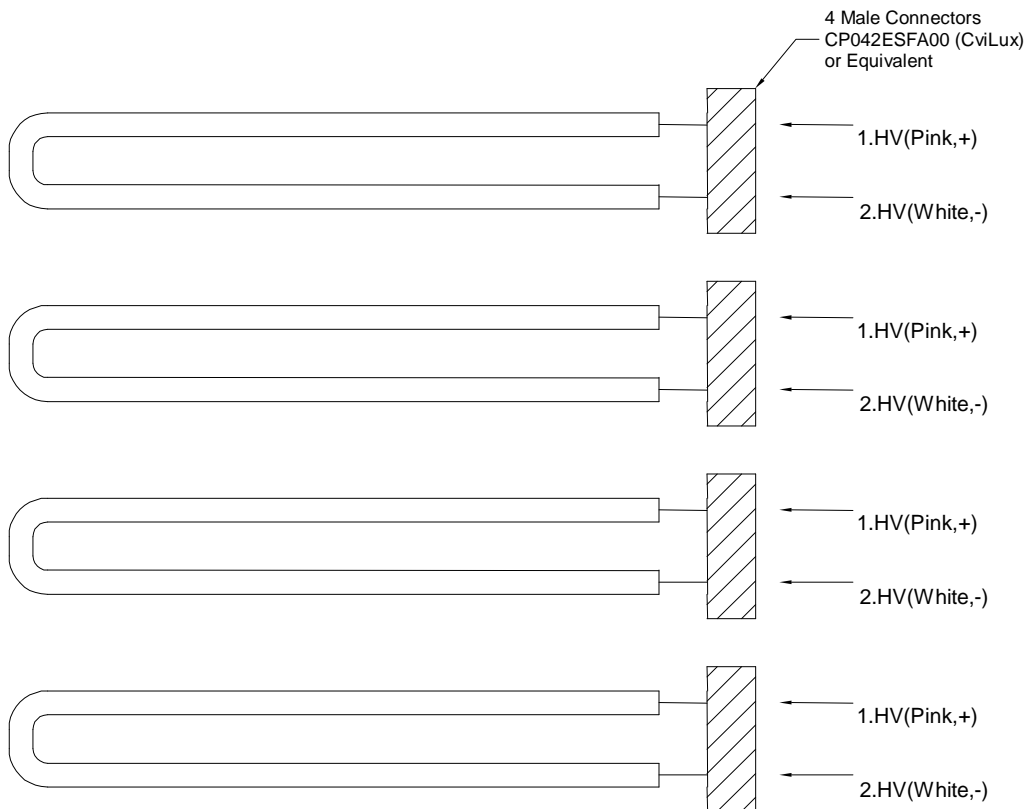
5.2 BACKLIGHT UNIT

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

Housing : 1. CP042ESFA00 (CviLux)

Pin No.	Symbol	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 1. CP042ESFA00 (CviLux) or Equivalent.



5.3 INVERTER UNIT

CN1 : CI0114M1HRL-NH (CviLux)

Pin No.	Symbol	Description
1	VBL	+24V Power input
2		
3		
4		
5		
6	GND	Ground
7		
8		
9		
10		
11	ERR	Normal (GND) Abnormal(Open collector)
12	BLON	BL ON/OFF
13	I_PWM	Internal PWM Control
14	E_PWM	External PWM Control

Note (1) PIN 13:Internal PWM Control (Use Pin 13): Pin 14 must open.

Note (2) PIN 14:External PWM Control (Use Pin 14): Pin 13 must open.

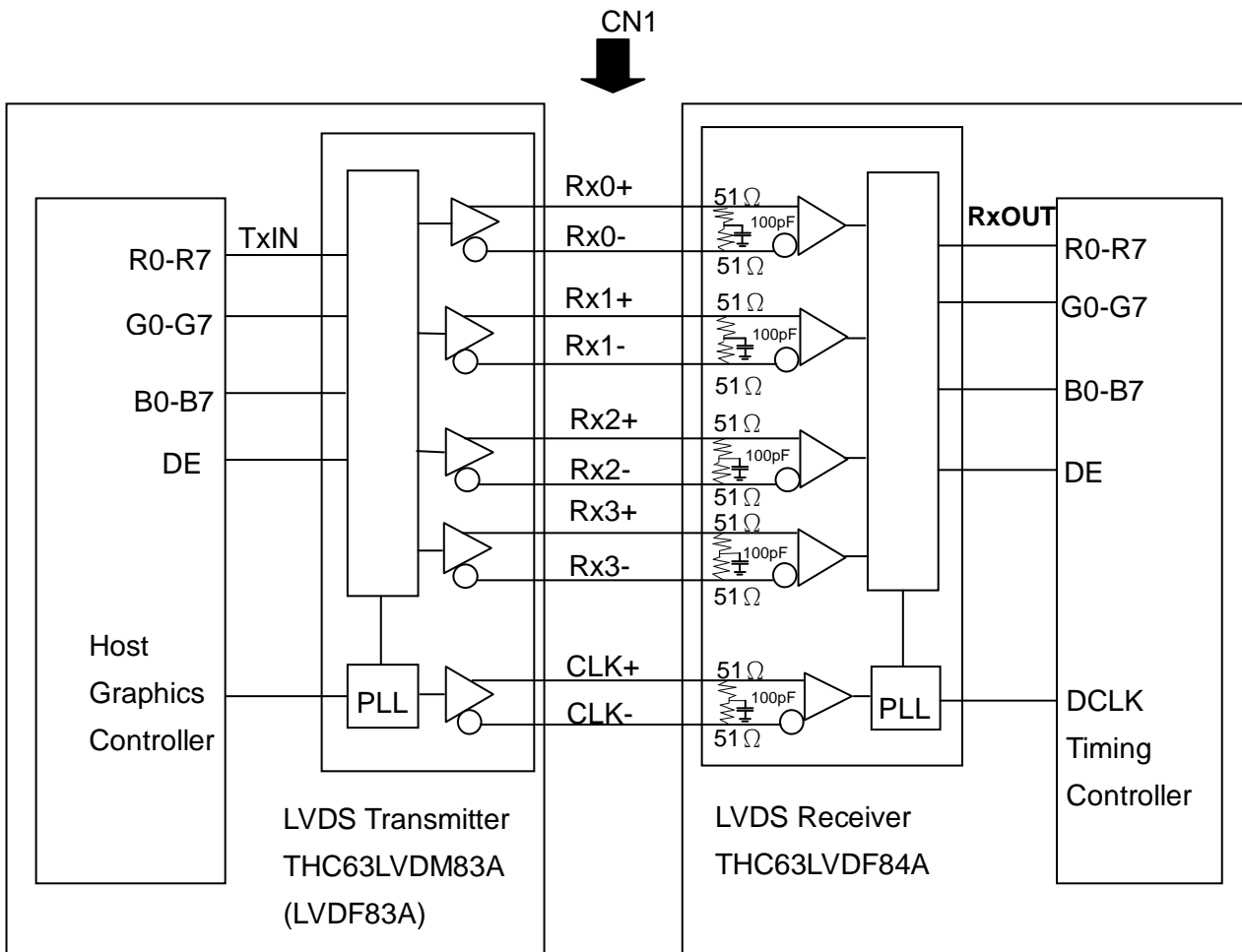
Note (3) Pin 13(I_PWM) and Pin 14(E_PWM) can't open in same period.

Note (4) CviLux connector is also compatible with Yeonho harness (2002WR-14AML).

CN2-CN5 : CP042EP1MFB-LF (CviLux).

Pin	Name	Description
1	CCFL HOT	CCFL High Voltage
2	CCFL HOT	CCFL High Voltage

5.4 BLOCK DIAGRAM OF INTERFACE



R0~R7 : Pixel R Data

G0~G7 : Pixel G Data

B0~B7 : Pixel B Data

DE : Data Enable Signal

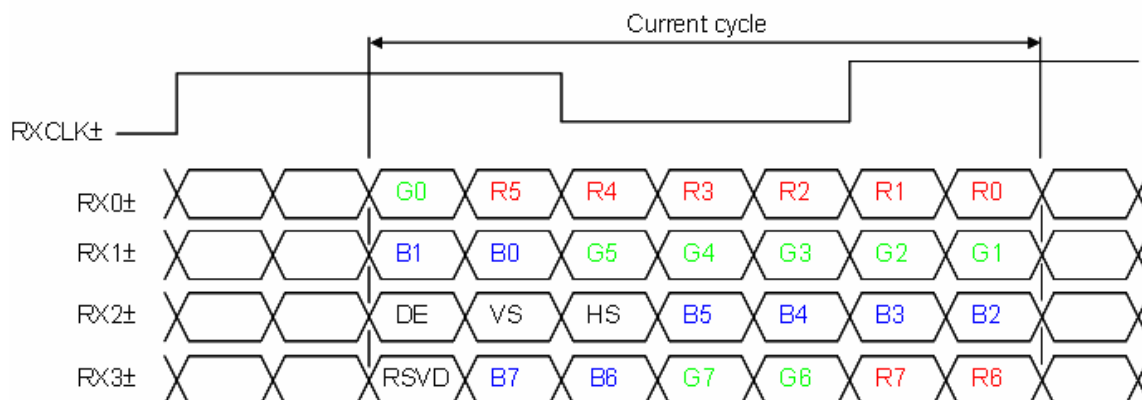
DCLK : Data clock signal

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

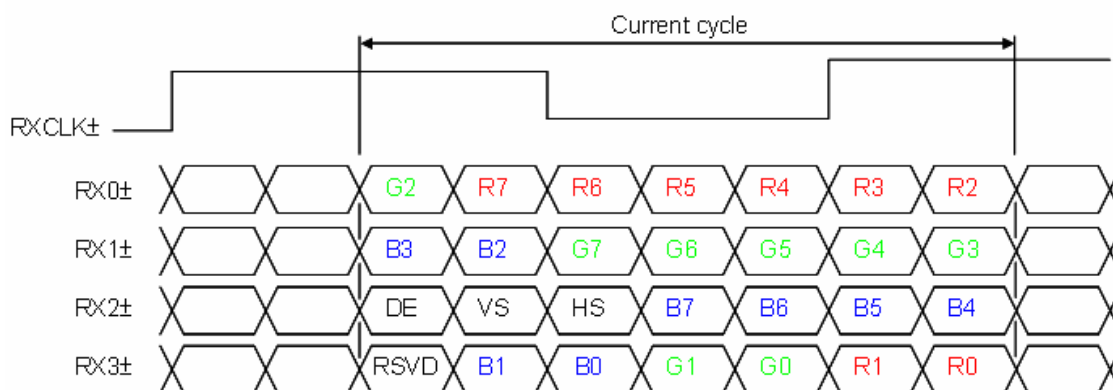
Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5.5 LVDS INTERFACE

VESA LVDS format : (SELLVDS pin=H or open)



JEDIA LVDS format : (SELLVDS pin=L)



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

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 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	
	Red	1	1	1	1	1	1	1	1	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	
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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	
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	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	
	White	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		
	Red(1)	0	0	0	0	0	0	0	1	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		
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	Red(253)	1	1	1	1	1	1	0	1	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		
	Red(255)	1	1	1	1	1	1	1	1	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		
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	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		
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	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		
	Blue(1)	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	1		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0		
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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		

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	$F_{clk_{in}}$ (=1/TC)	60	76	82	MHz	
	Input cycle to cycle jitter	T_{rcj}	—	—	200	ps	(3)
	Spread spectrum modulation range	$F_{clk_{in_mod}}$	$F_{clk_{in}}-2\%$	—	$F_{clk_{in}}+2\%$	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}			200	KHz	
LVDS Receiver Data	Setup Time	T_{lvsu}	600	—	—	ps	(5)
	Hold Time	T_{lvhd}	600	—	—	ps	
Vertical Active Display Term	Frame Rate	F_{r5}	47	50	53	Hz	(6)
		F_{r6}	57	60	63	Hz	
	Total	T_v	778	806	1000	Th	$T_v=T_{vd}+T_{vb}$
	Display	T_{vd}	768	768	768	Th	—
	Blank	T_{vb}	10	38	232	Th	—
Horizontal Active Display Term	Total	T_h	1442	1560	1936	T_c	$T_h=T_{hd}+T_{hb}$
	Display	T_{hd}	1366	1366	1366	T_c	—
	Blank	T_{hb}	76	194	570	T_c	—

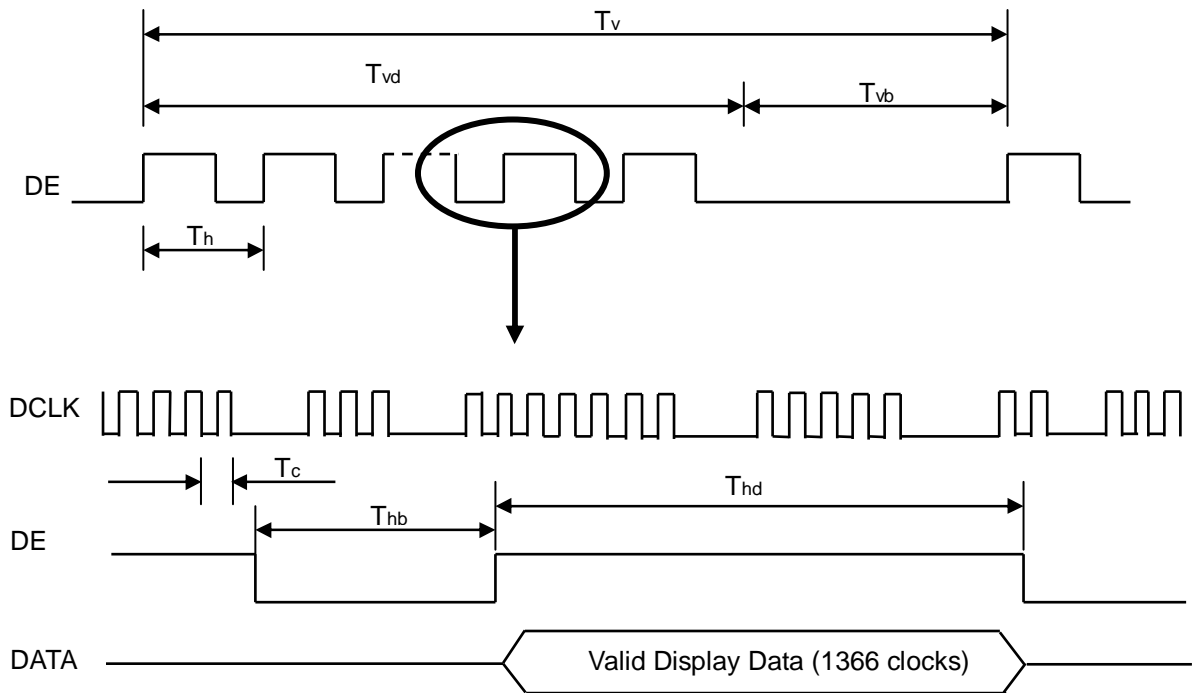
Note (1) Please make sure the range of pixel clock has follow the below equation :

$$F_{clk_{in}(max)} \geq F_{r6} \times T_v \times T_h$$

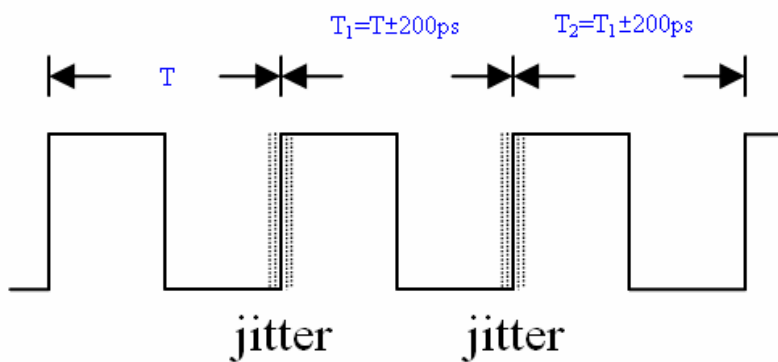
$$F_{r5} \times T_v \times T_h \geq F_{clk_{in}(min)}$$

Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below :

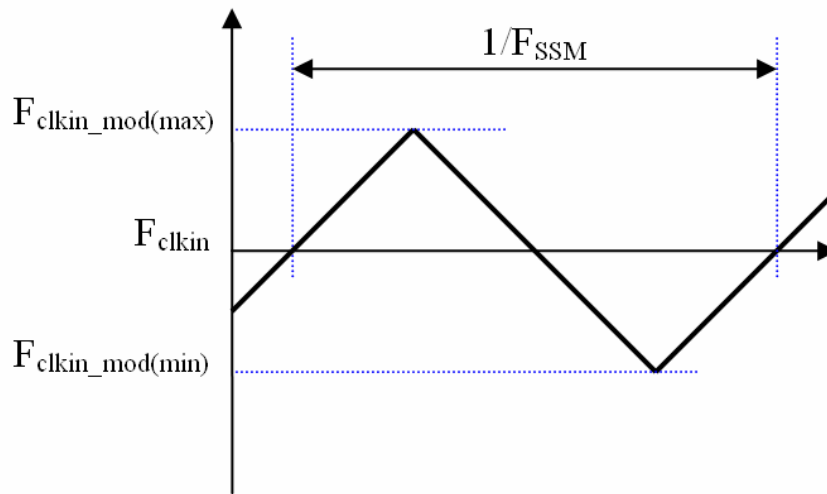
INPUT SIGNAL TIMING DIAGRAM



Note (3) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T_1 - T_1|$

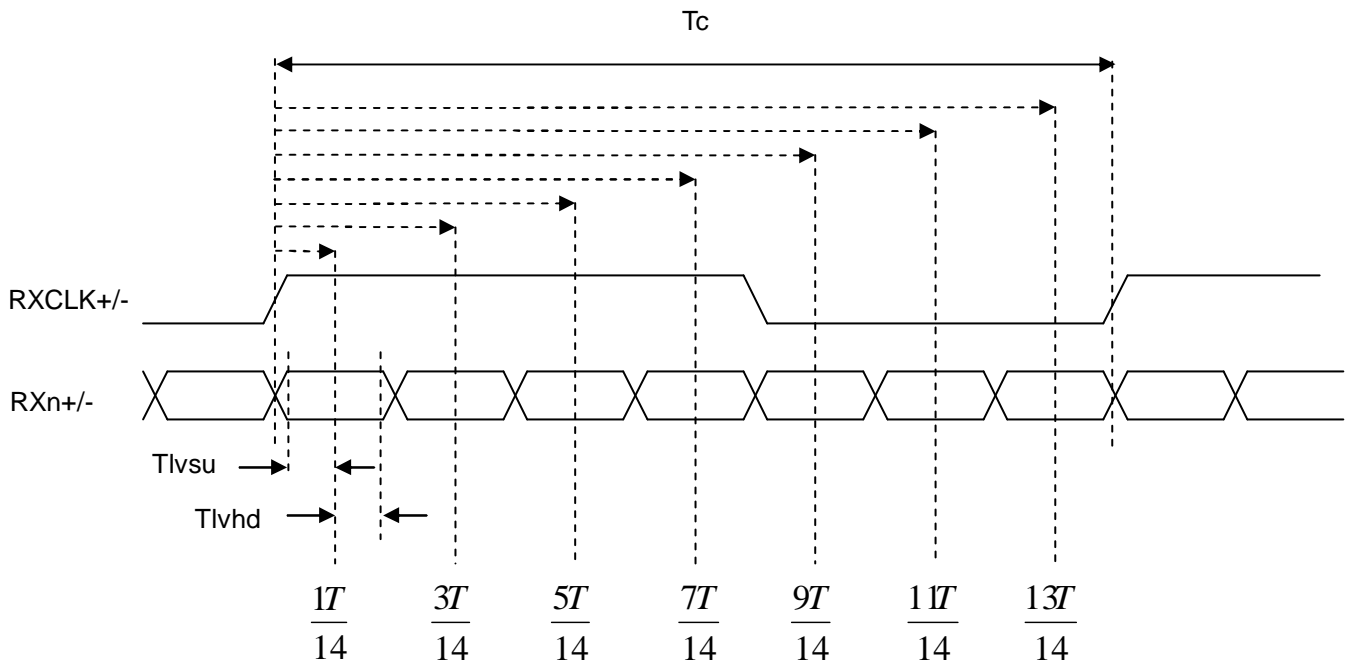


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

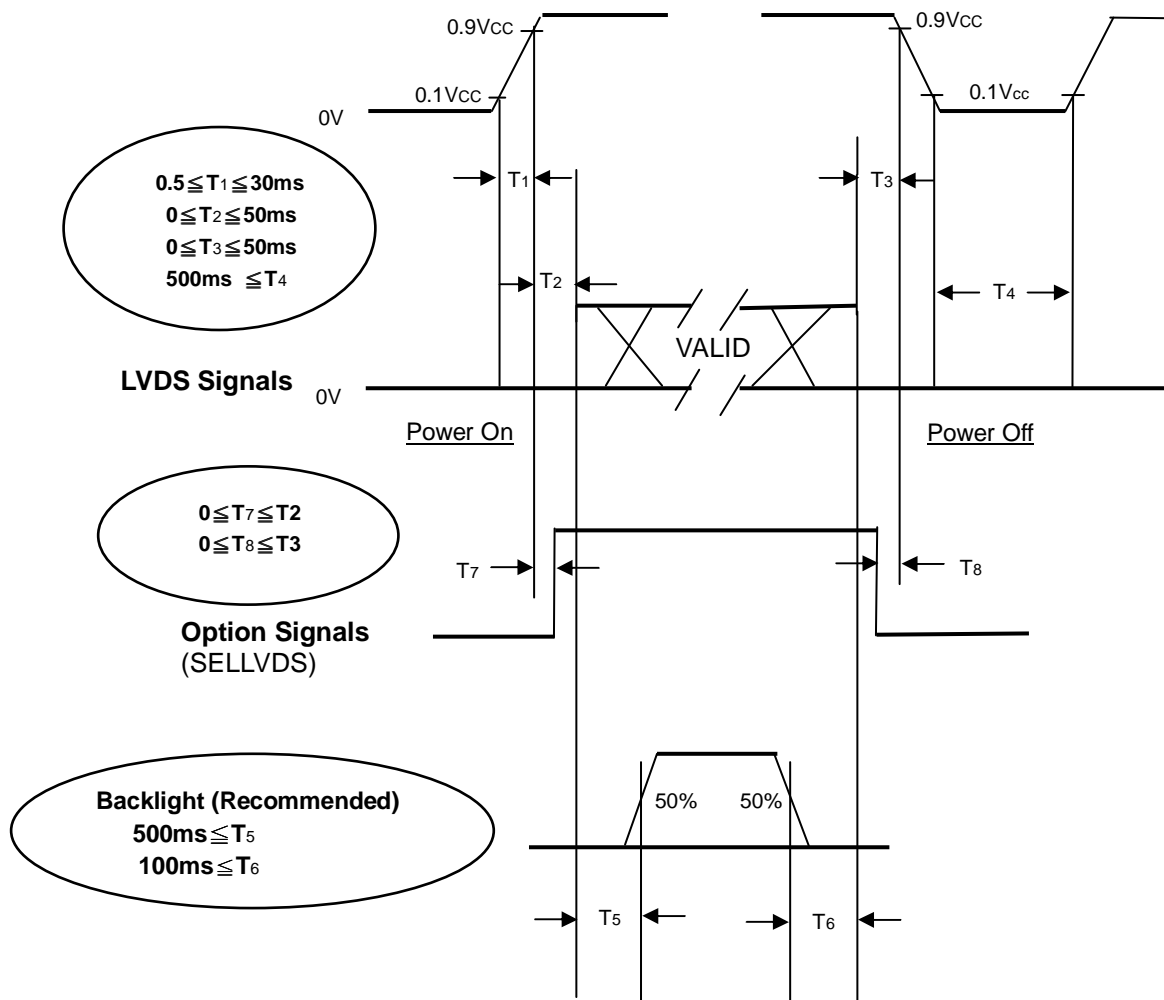
LVDS RECEIVER INTERFACE TIMING DIAGRAM



6.2 POWER ON/OFF SEQUENCE

($T_a = 25 \pm 2 \text{ }^\circ\text{C}$)

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

Note (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.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If $T_2 < 0$, that maybe cause electrical overstress failure.

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

Note (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 _{CC}	12.0± 0.2	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I _L	10.0mA ± 0.5	mA
Oscillating Frequency (Inverter)	F _w	58 ± 3	KHz
Vertical Frame Rate	Fr	60± 3	Hz

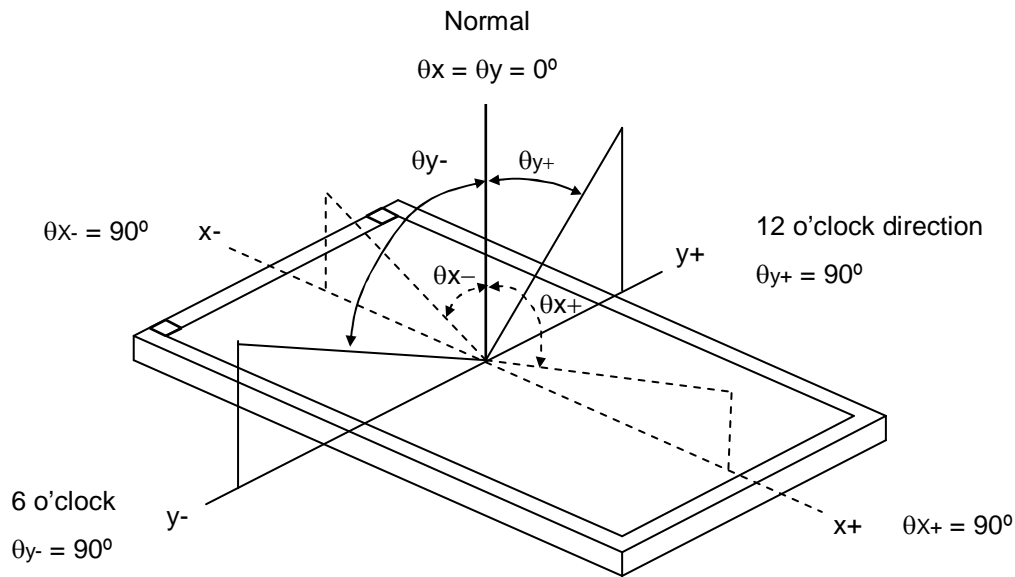
7.2 OPTICAL SPECIFICATIONS

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 (6).

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing angle at normal direction.	2000	3000	-	-	(2)	
Response Time	Gray to gray		-	8.5	14	ms	(3)	
Center Luminance of White	L _c		350	450	-	Cd/m ²	(4)	
White Variation	δW		-	-	1.3	-	(7)	
Cross Talk	CT		-	-	4	%	(5)	
Color Chromaticity	Red		R _x	Typ. -0.03	0.646	Typ. +0.03	-	(6)
			R _y		0.334		-	
	Green		G _x		0.273		-	
			G _y		0.596		-	
	Blue		B _x		0.143		-	
		B _y	0.068		-			
	White	W _x	0.280		-			
W _y	0.285	-						
Color Gamut	CG	68	72	-	%	NTSC		
Viewing Angle	Horizontal	θ_{x+}	80	88	Deg.	(1)		
		θ_{x-}	80	88				
	Vertical	θ_{y+}	80	88				
		θ_{y-}	80	88				
			80	88				

Note (1) Definition of Viewing Angle (θ_x, θ_y):

Viewing angles are measured by Autronic Conoscope Cono-80.



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

The contrast ratio can be calculated by the following expression.

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

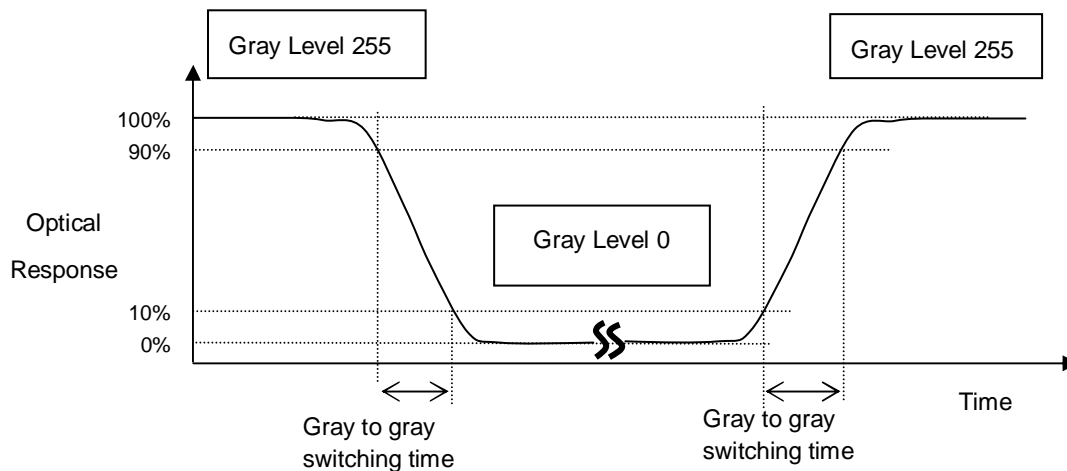
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

$$CR = CR (X),$$

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 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.

Note (4) Definition of Luminance of White (L_C):

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

$$L_C = L(5)$$

$L(X)$ is corresponding to the luminance of the point X at the figure in Note (7).

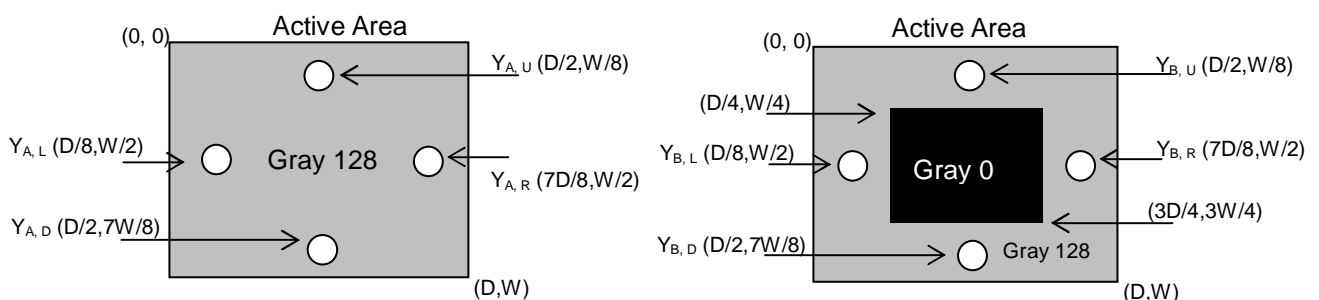
Note (5) Definition of Cross Talk (CT):

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

Where:

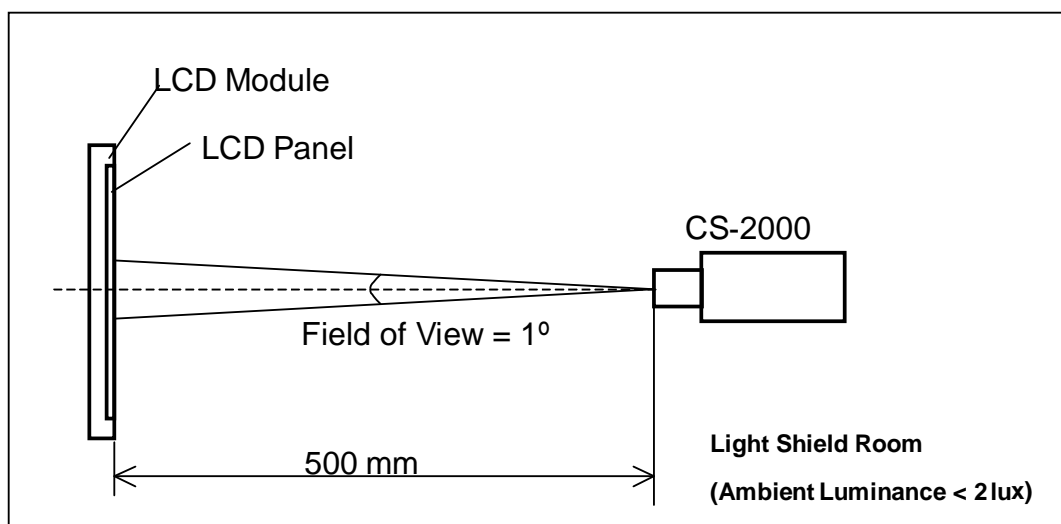
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

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



Note (6) Measurement Setup:

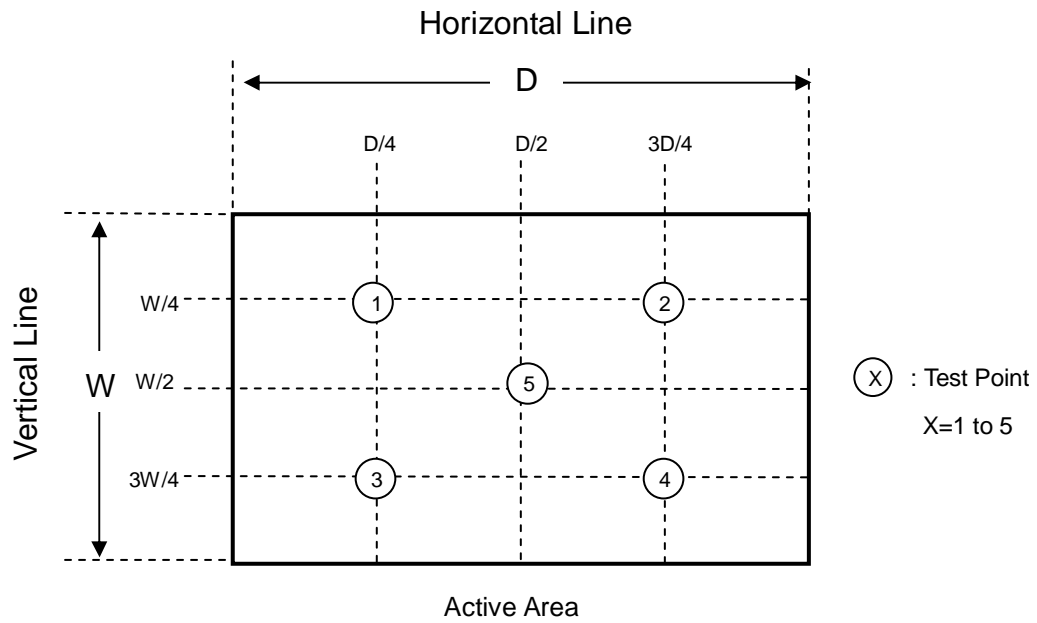
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



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

Measure the luminance of gray level 255 at 5 points

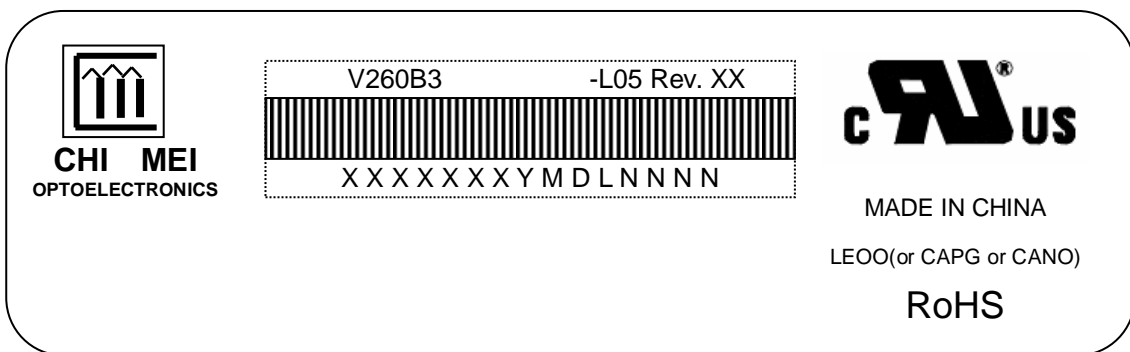
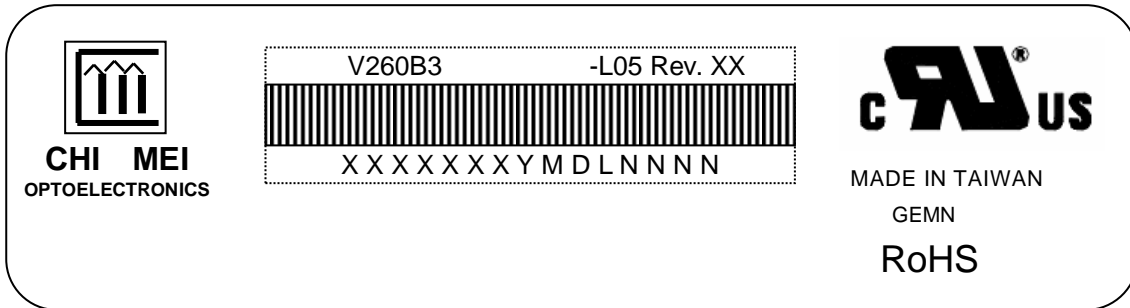
$$\delta W = \text{Maximum} [L(1), L(2), L(3), L(4), L(5)] / \text{Minimum} [L(1), L(2), L(3), L(4), L(5)]$$



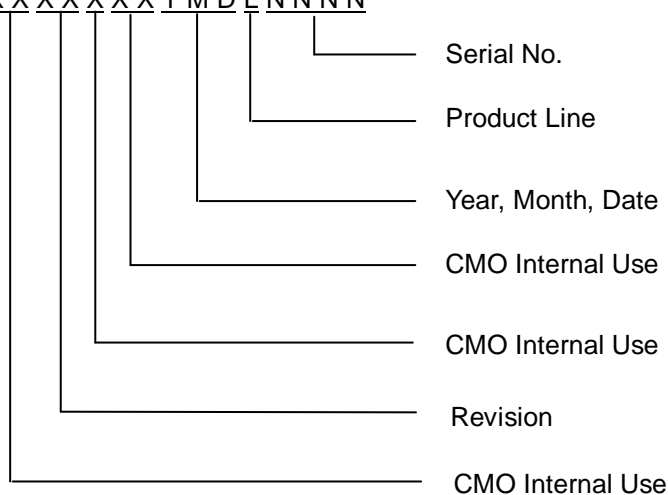
8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

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



- (a) Model Name: V260B3-L05
- (b) Revision: Rev. XX, for example: A0, A1... B1, B2... or C1, C2...etc.
- (c) Serial ID: XXXXXXXXYMDLNNNN



Serial ID includes the information as below:

- (a) Manufactured Date: Year: 1~9, for 2001~2009
 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.

9. PACKAGING

9.1 PACKING SPECIFICATIONS

- (1) 6 LCD TV modules / 1 Box
- (2) Box dimensions : 713(L)x429(W)x453(H)mm
- (3) Weight : approximately 25.1 Kg (6 modules per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

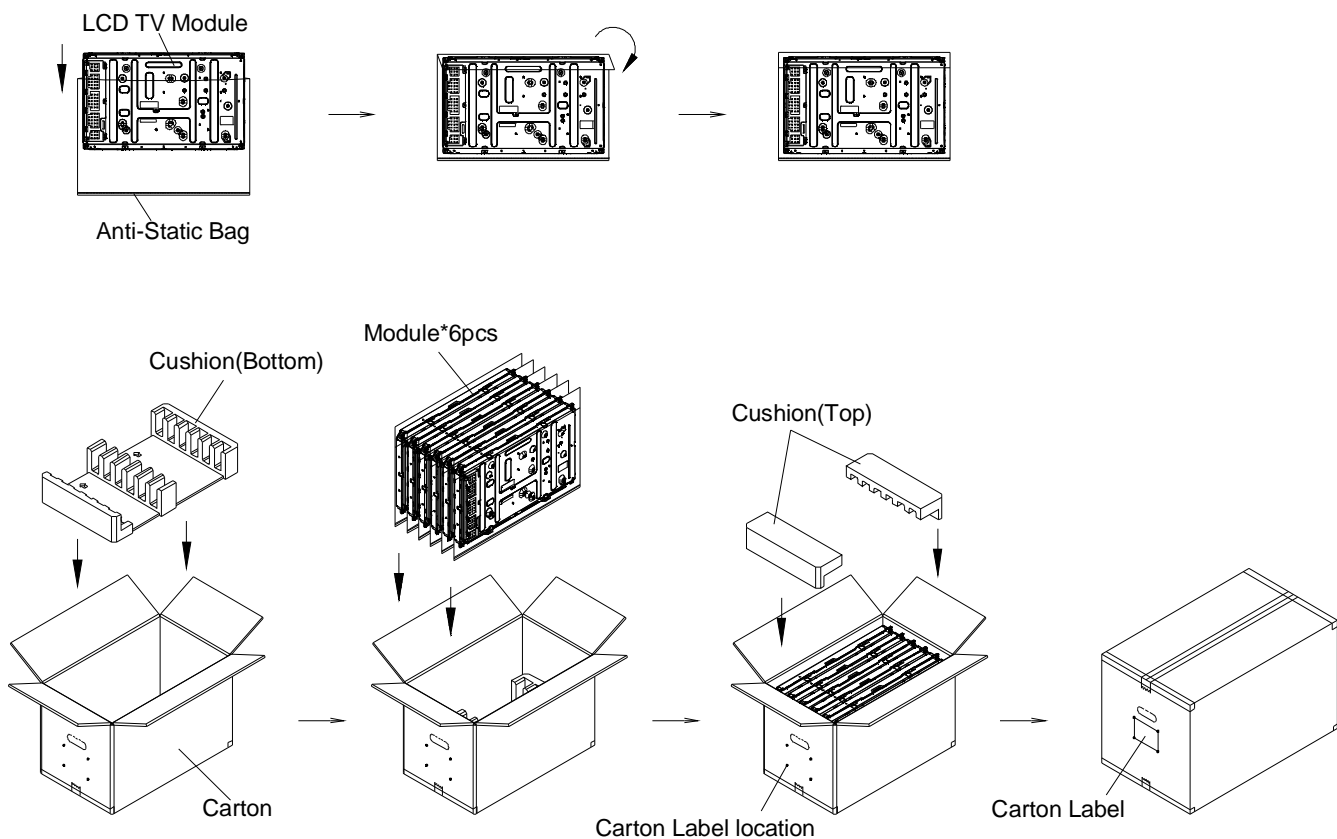
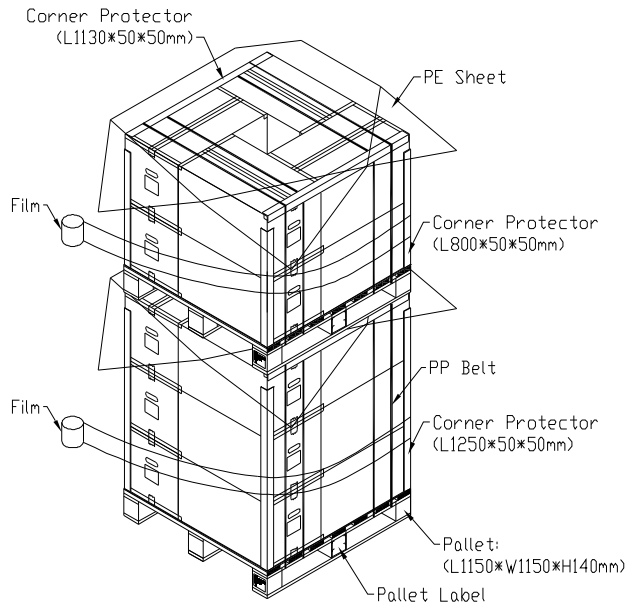
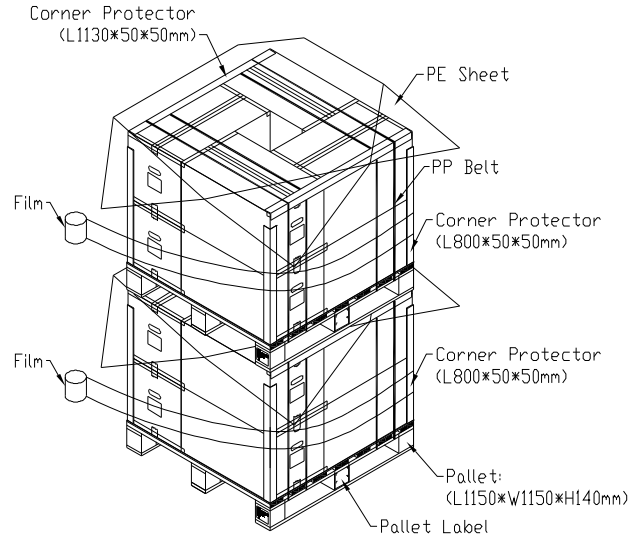


Figure.9-1 packing method

Sea / Land Transportation
(40ft HQ Container)



Sea / Land Transportation
(40ft Container)



Air Transportation

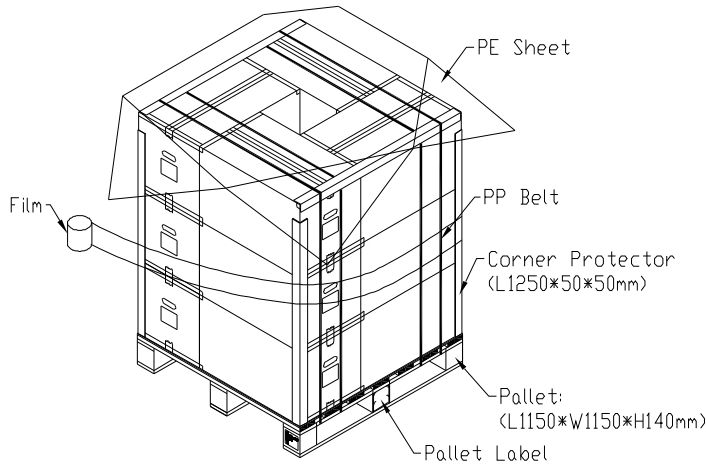


Figure.9-2 Packing method

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 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.

10.2 SAFETY PRECAUTIONS

- (1) The startup voltage of a backlight is over 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.

10.3 STORAGE PRECAUTIONS

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

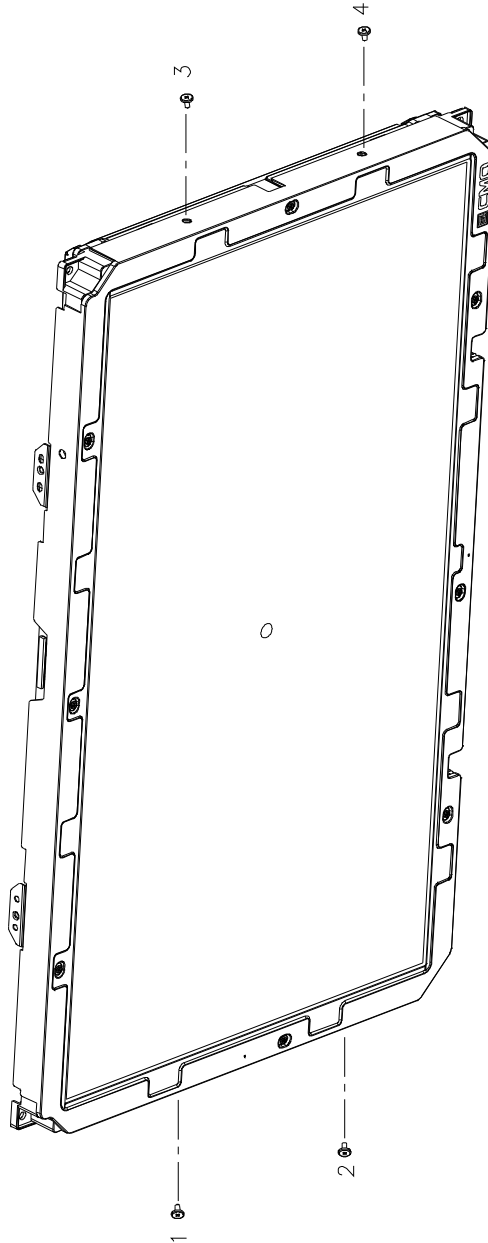
- (1) Do not leave the module in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35°C at normal humidity without condensation.
- (2) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

11. REGULATORY STANDARDS

11.1 SAFETY

Regulatory	Item	Standard
Information Technology equipment	UL	UL 60950-1: 2007
	cUL	CAN/CSA C22.2 No.60950-1-03: 2006
	CB	IEC 60950 -1:2005 EN60950-1:2009
Audio/Video Apparatus	UL	UL 60065: 2007
	cUL	CAN/CSA C22.2 No.60065-03:2006
	CB	IEC 60065:2005 EN 60065:2006

NOTE:
1. We recommend oil fixture screws(No.1 to 4)are included while assembling.(Side Mount)
2. Torque of all M4 screws are 10kgf-cm(MAX).



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DATE	DATE	DATE	DATE
DESIGNER	DESIGNER	DESIGNER	DESIGNER
DRAWN	DRAWN	DRAWN	DRAWN
REV: A	REV: A	REV: A	REV: A
TITLE	TITLE	TITLE	TITLE
SCALE	SCALE	SCALE	SCALE
SHEET	SHEET	SHEET	SHEET
1/1	1/1	1/1	1/1
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DESIGNER	DESIGNER	DESIGNER	DESIGNER
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