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□ Tentative Specification
□ Preliminary Specification
■ Approval Specification

MODEL NO.: V645H1
SUFFIX: LE1

Customer: SONY

APPROVED BY SIGNATURE

Name / Title _____ _____

Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
Chao-Chun Chung	Denise Shieh	Alan Hung

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REVISION HISTORY

Version	Date	Page(New)	Section	Description
Ver. 2.0	Apr.26,2011	All	All	The approval specification was first issued.
Ver. 2.1	May 25, 2011	12	3.2	Modify LED light bar $\triangle V_W$
		14,15	5.1	Revise pin description and add CN11,CN6 information.
		17	5.2	Add backlight unit black Diagram.
		26	6.2	Power on/off sequence ,add EDID timming.
		27	6.3	Add EDID identification table.
		29	7.2	Update center luminance of white . Add gray to gray ,white variation.

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

V645H1-LE1 is a 64.5" TFT Liquid Crystal Display module with LED Backlight unit and 2ch LVDS interface. This module supports 1920 x 1080 Full HDTV format and can display 1.07G colors (8-bit+hi-FRC). The converter module for backlight is built-in.

1.2 FEATURES

- High brightness (440 nits)
- High contrast ratio (5000:1)
- Fast response time (4ms)
- High color saturation (NTSC 72%)
- Full HDTV (1920 x 1080 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for 240 Hz frame rate
- Ultra wide viewing angle : Super MVA technology
- Viewing Angle : 176(H)/176(V) (CR>20)
- RoHs compliance

1.3 APPLICATION

- Standard Living Room TVs
- Public Display Application
- Home Theater Application
- MFM Application

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	1428.48 (H) x 803.52 (V) (64.5" diagonal)	mm	(1)
Bezel Opening Area	1440.6(H) x 814.6(V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch(Sub Pixel)	0.248 (H) x 0.744 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	1.07G colors (8-bit+hi-FRC)	color	-
Display Operation Mode	Transmissive mode / Normally Black	-	-
Surface Treatment	Hard coating and glare type (Hardness:3H)	-	(3)

Note (1) Please refer to the attached drawings in chapter 11 for more information about the front and back outlines.

Note (2) Please refer sec 3.1 and 3.2 for more information of Power consumption

Note (3) The spec. of the surface treatment is temporarily for this phase. CMI reserves the rights to change this feature.

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1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	1472.3	1474.1	1475.9	mm	(1)
	Vertical (V)	849.1	850.6	852.1	mm	(1)
	Depth (D)	34	35	36	mm	(2)
	Depth (D)	25.3	26.3	27.3	mm	(3)
Weight		-	29600	-	g	-

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

Note (2) Module Depth is between bezel to T-CON cover.

Note (3) Module Depth is between bezel to LD-board cover.

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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	+60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)
Shock (Non-Operating)	SNOP	-	35	G	(3), (5)
Vibration (Non-Operating)	VNOP	-	1.0	G	(4), (5)

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

(a) 90 %RH Max. (Ta ≦ 40 ºC).

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

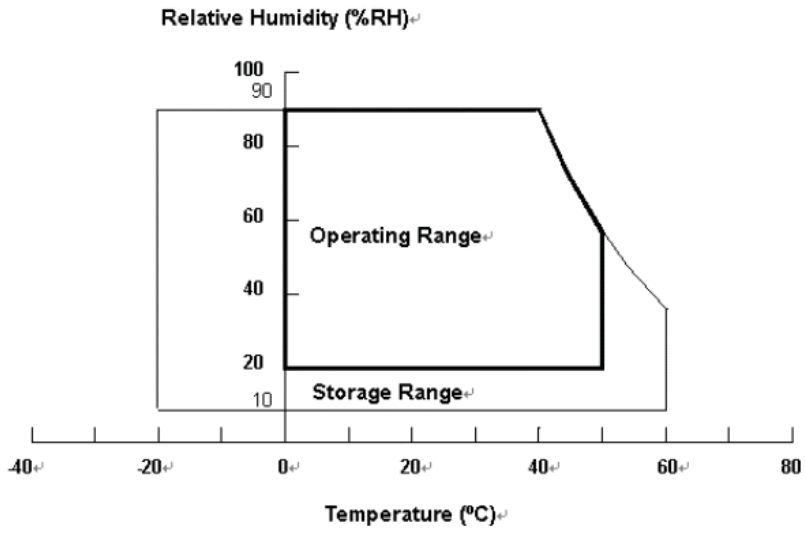
(c) No condensation.

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

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

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

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



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2.2 PACKAGE 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	VCC	-0.3	13.5	V	(1)
Logic Input Voltage	VIN	-0.3	3.6	V	

2.3.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Light bar Voltage	VW	-	57.6	V_{DC}	

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.

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	—	—	3.39	A	(2)
Power consumption	White Pattern	P_T	—	15.756	18.876	W	(3)
	Horizontal Stripe	P_T	—	31.512	36.6	W	
	Black Pattern	P_T	—	15.912	18.876	W	
Power Supply Current	White Pattern	—	—	1.313	1.573	A	(3)
	Horizontal Stripe	—	—	2.626	3.05	A	
	Black Pattern	—	—	1.326	1.573	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_{CM}	1.0	1.2	1.4	V	
	Differential input voltage (single-end)	$\|V_{ID}\|$	200	—	600	mV	
	Terminating Resistor	R_T	—	100	—	ohm	
CMIS interface	Input High Threshold Voltage	V_{IH}	2.7	—	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	—	0.7	V	

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

Note (2) Measurement condition:

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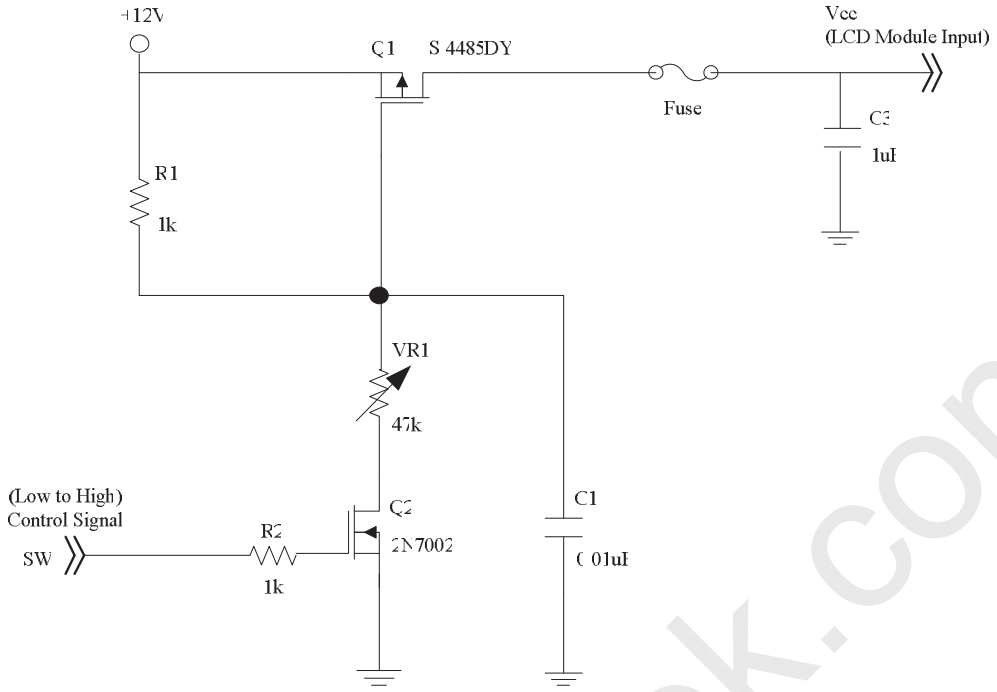
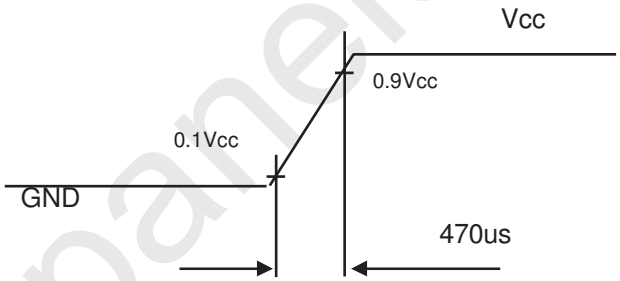


Vcc rising time is 470us



Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, f_v = 240 Hz, whereas a power dissipation check pattern below is displayed.

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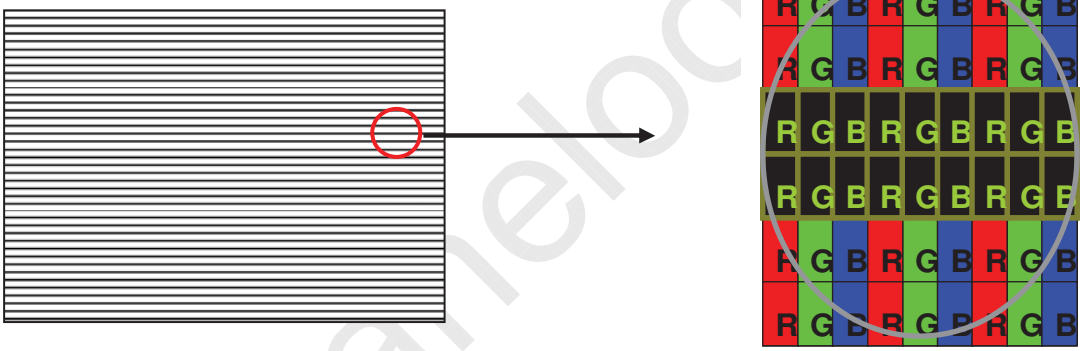
a. White Pattern

Active Area

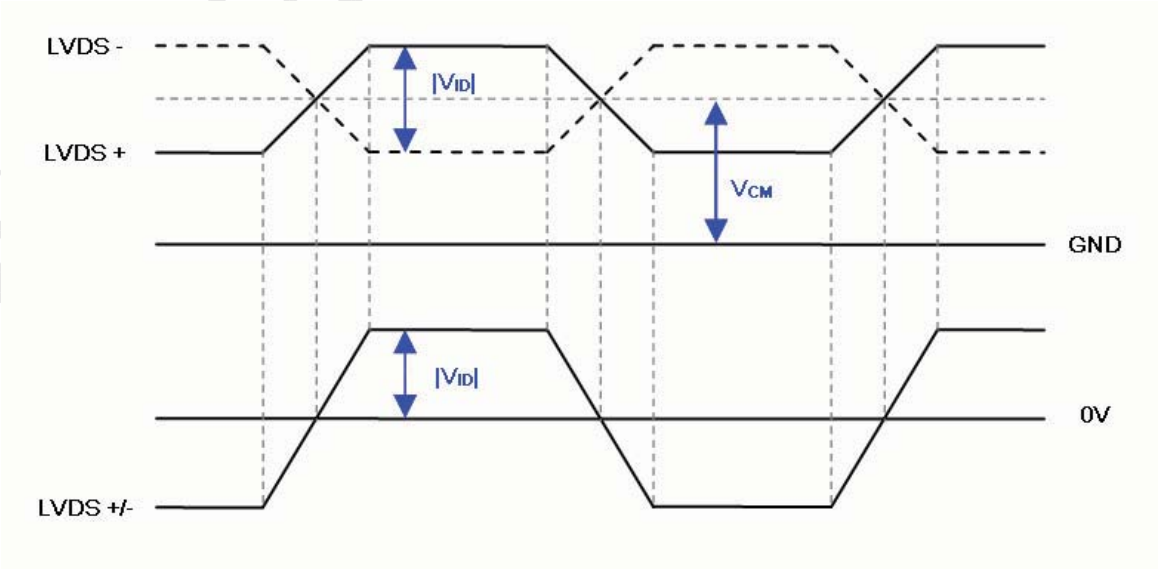
b. Black Pattern

Active Area

c. Horizontal Pattern



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



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3.2 BACKLIGHT CONNECTOR PIN CONFIGURATION

3.2.1 LED LIGHT BAR CHARACTERISTICS (Ta = 25 ± 2 ºC)

The backlight unit contains 4pcs light bar.

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Total Current	If	827.2	880	932.8	mA	
One String Current	I_L	103.4	110	116.6	mA	
One String Voltage	V_W	43.2	-	57.6	V_{DC}	I_L =110mA
One String Voltage Variation	$\triangle V_W$	-	-	1.54	V	For 1 BLU
Power Consumption	P_{BL}	-	45.06	-	W	I_L =110mA
Life time	-			30000	Hrs	(1)

Note (1) The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value, Operating condition: Continuous operating at Ta = 25±2℃, I_L =110mA.

(2) The power consumption is defined as one light bar operating at I_L =110mA.

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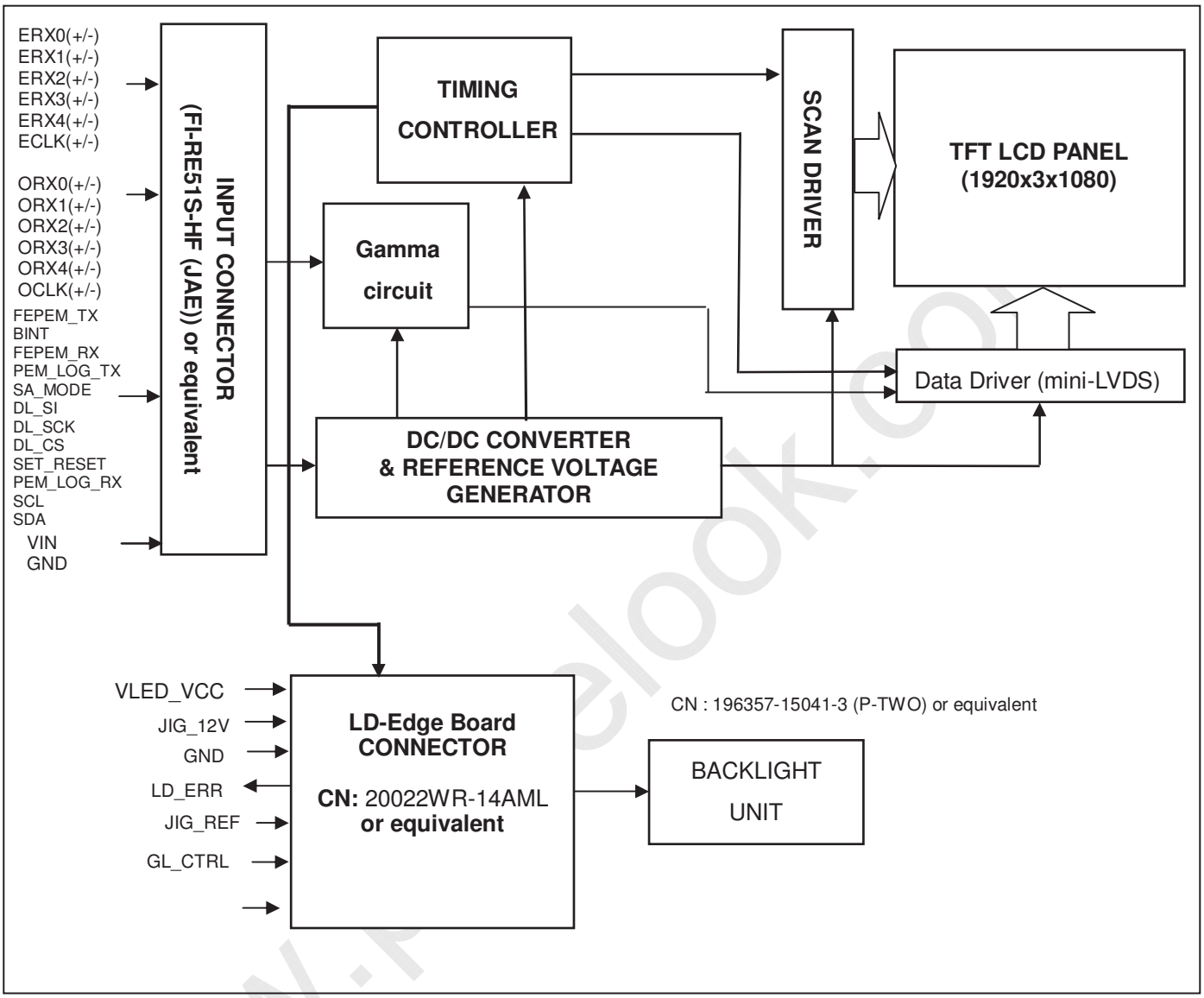
4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD MODULE



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5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD Module Input

CNF1 Connector Part No.: JAE Taiwan (台灣航空電子) FI-RE51S-HF or equivalent.

Pin	Name	Description	Note
1	VCC	+12V power supply	
2	VCC	+12V power supply	
3	VCC	+12V power supply	
4	VCC	+12V power supply	
5	VCC	+12V power supply	
6	NC	No Connection	
7	NC	No Connection	
8	GND	Ground	
9	GND	Ground	
10	ORX0-	1st pixel Negative LVDS differential data input. Channel 0	
11	ORX0+	1st pixel Positive LVDS differential data input. Channel 0	
12	ORX1-	1st pixel Negative LVDS differential data input. Channel 1	(1)
13	ORX1+	1st pixel Positive LVDS differential data input. Channel 1	
14	ORX2-	1st pixel Negative LVDS differential data input. Channel 2	
15	ORX2+	1st pixel Positive LVDS differential data input. Channel 2	
16	GND	Ground	
17	OCLK-	1st pixel Negative LVDS differential clock input.	(1)
18	OCLK+	1st pixel Positive LVDS differential clock input	
19	GND	Ground	
20	ORX3-	1st pixel Negative LVDS differential data input. Channel 3	
21	ORX3+	1st pixel Positive LVDS differential data input. Channel 3	
22	ORX4-	1st pixel Negative LVDS differential data input. Channel 4	(1)
23	ORX4+	1st pixel Positive LVDS differential data input. Channel 4	
24	GND	Ground	
25	ERX0-	2nd pixel Negative LVDS differential data input. Channel 0	
26	ERX0+	2nd pixel Positive LVDS differential data input. Channel 0	
27	ERX1-	2nd pixel Negative LVDS differential data input. Channel 1	
28	ERX1+	2nd pixel Positive LVDS differential data input. Channel 1	(1)
29	ERX2-	2nd pixel Negative LVDS differential data input. Channel 2	
30	ERX2+	2nd pixel Positive LVDS differential data input. Channel 2	
31	GND	Ground	
32	ECLK-	2nd pixel Negative LVDS differential clock input.	(1)
33	ECLK+	2nd pixel Positive LVDS differential clock input	
34	GND	Ground	
35	ERX3-	2nd pixel Negative LVDS differential data input. Channel 3	
36	ERX3+	2nd pixel Positive LVDS differential data input. Channel 3	
37	ERX4-	2nd pixel Negative LVDS differential data input. Channel 4	(1)
38	ERX4+	2nd pixel Positive LVDS differential data input. Channel 4	
39	GND	Ground	
40	SCL	I2C Clock input (for Auto-VCOM)	
41	SDA	I2C Data signal (for Auto-VCOM)	

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42	FE_PEM_TX	UART1_RX	(4)
43	BUS_SW	BUS_SW/BINT, pull-high as Auto-VCOM adjusting. (for Auto-VCOM)	(3)
44	FE_PEM_RX	UART1_TX	(4)
45	PEM_LOG_TX	UART0_TX	
46	SA_MODE	Register Table Control	
47	DL_SI	Data Input for SPI	
48	X_PEM_RST	SET_RESET	
49	DL_SCK	Clock for SPI	
50	PEM_LOG_RX	UART0_RX	
51	DL_CS	Chip Select Signal for SPI	

CN11 Connector Part No.: JST(日本壓著端子), SM04B-PASS-1-TB(LF)(SN).

Pin	Name	Description	Note
1	VCC	+12V power supply	
2	VCC	+12V power supply	
3	GND	Ground	
4	GND	Ground	

CN6 Connector Part No.: JST(日本壓著端子), SM08B-GHS-TB(LF)(SN).

Pin	Name	Description	Note
1	VCC	+12V power supply	
2	VCC	+12V power supply	
3	GND	Ground	
4	GND	Ground	
5	GLS_CTRL	GLS_CTRL	
6	GLS_CTRL2	GLS_CTRL2	
7	EM_FAIL	EM_FAIL	
8	NC	No Connection	

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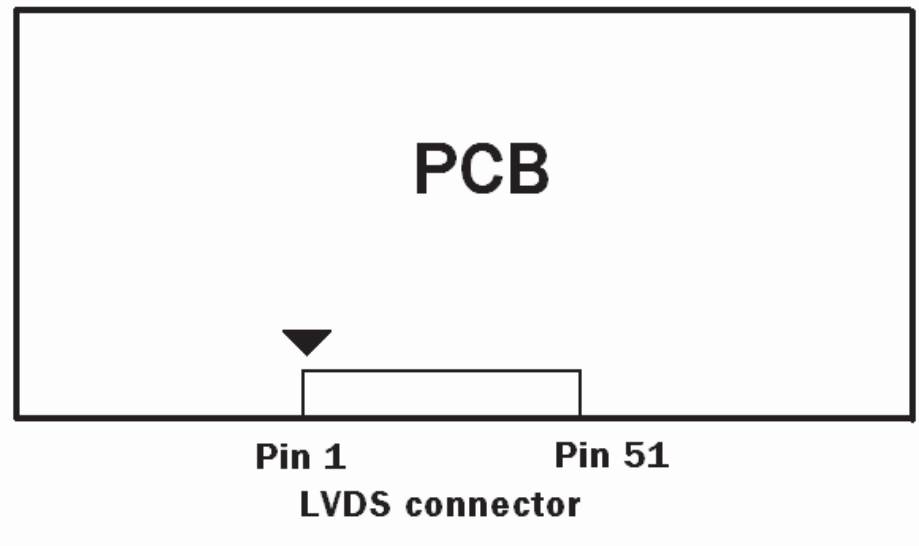
Note (1) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel

Note (2) LVDS connector pin order defined as follows



Note (3) Digital auto VCOM adjust control pin.

WP	Mode
L(default)	Internal week pull-low
H	Auto-VCOM adjust mode.

Note (4) Sony reserved pin for Sony system use.

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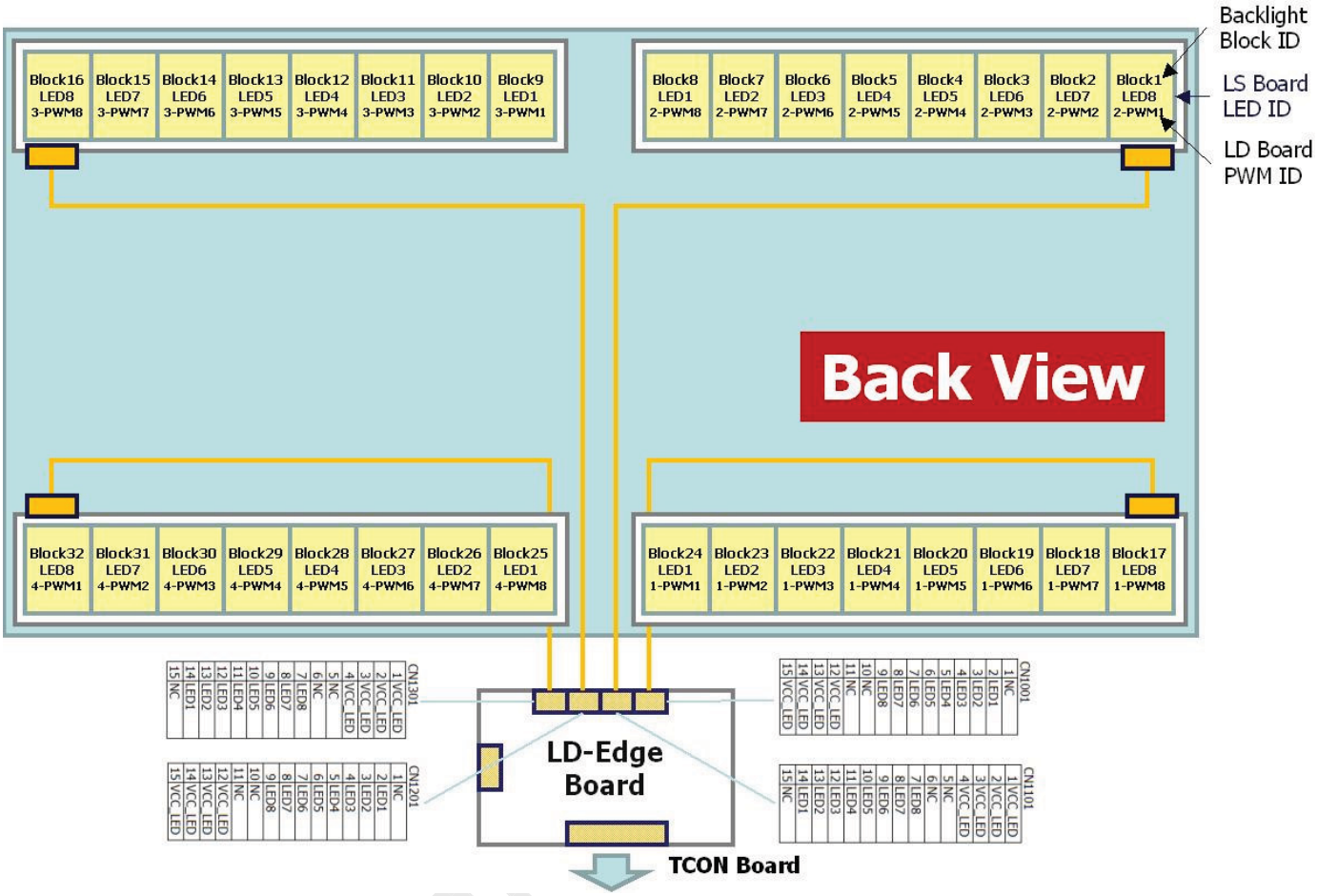
5.2 Backlight Unit Block Diagram



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5.3 LD-board UNIT

CN: 20022WR-14AML

Pin №	Symbol
1	VLED_VCC
2	
3	
4	
5	JIG_12V
6	GND
7	
8	
9	
10	
11	LD_ERR
12	JIG_REF
13	GL_CTRL
14	LED_ON

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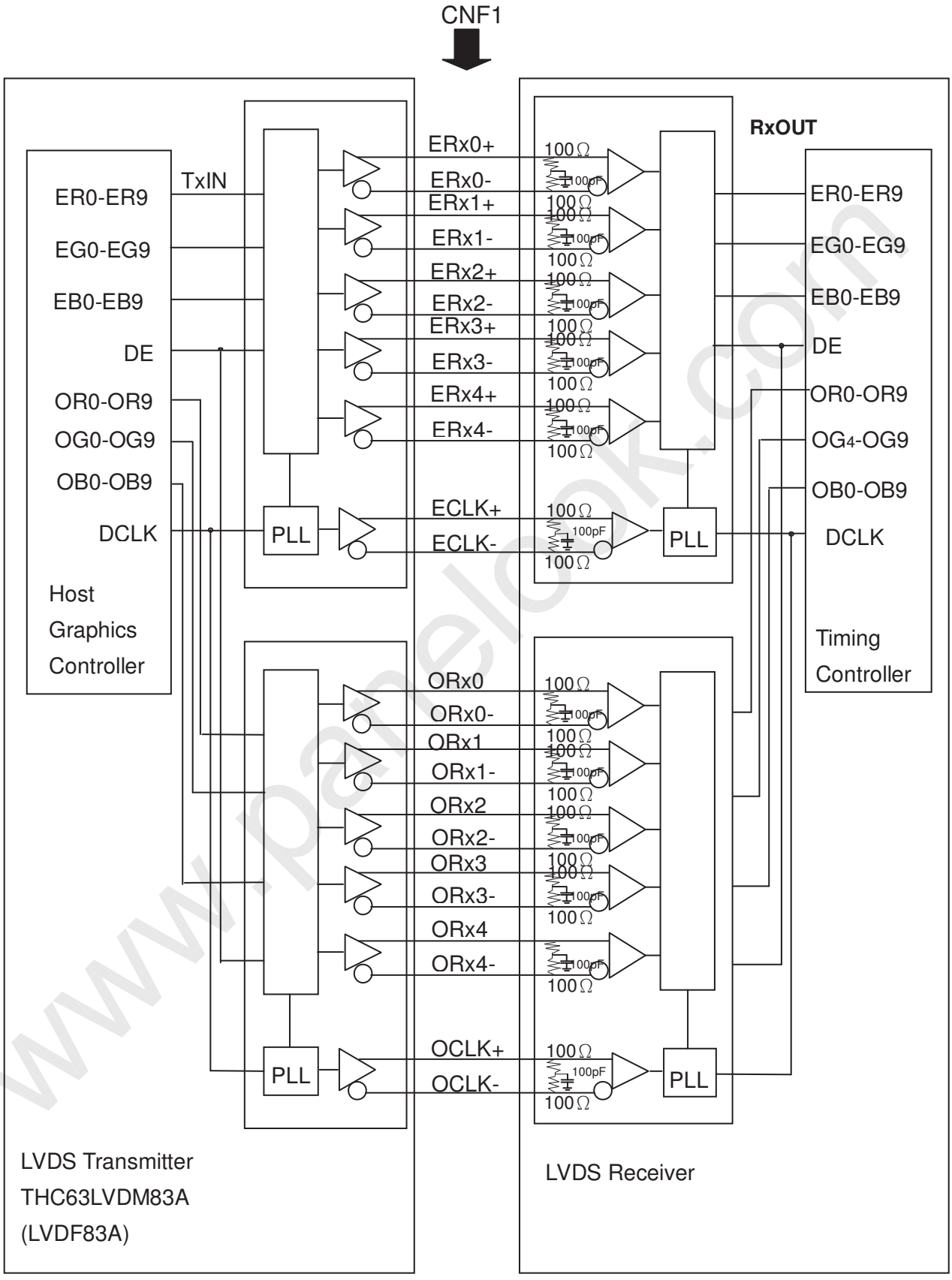

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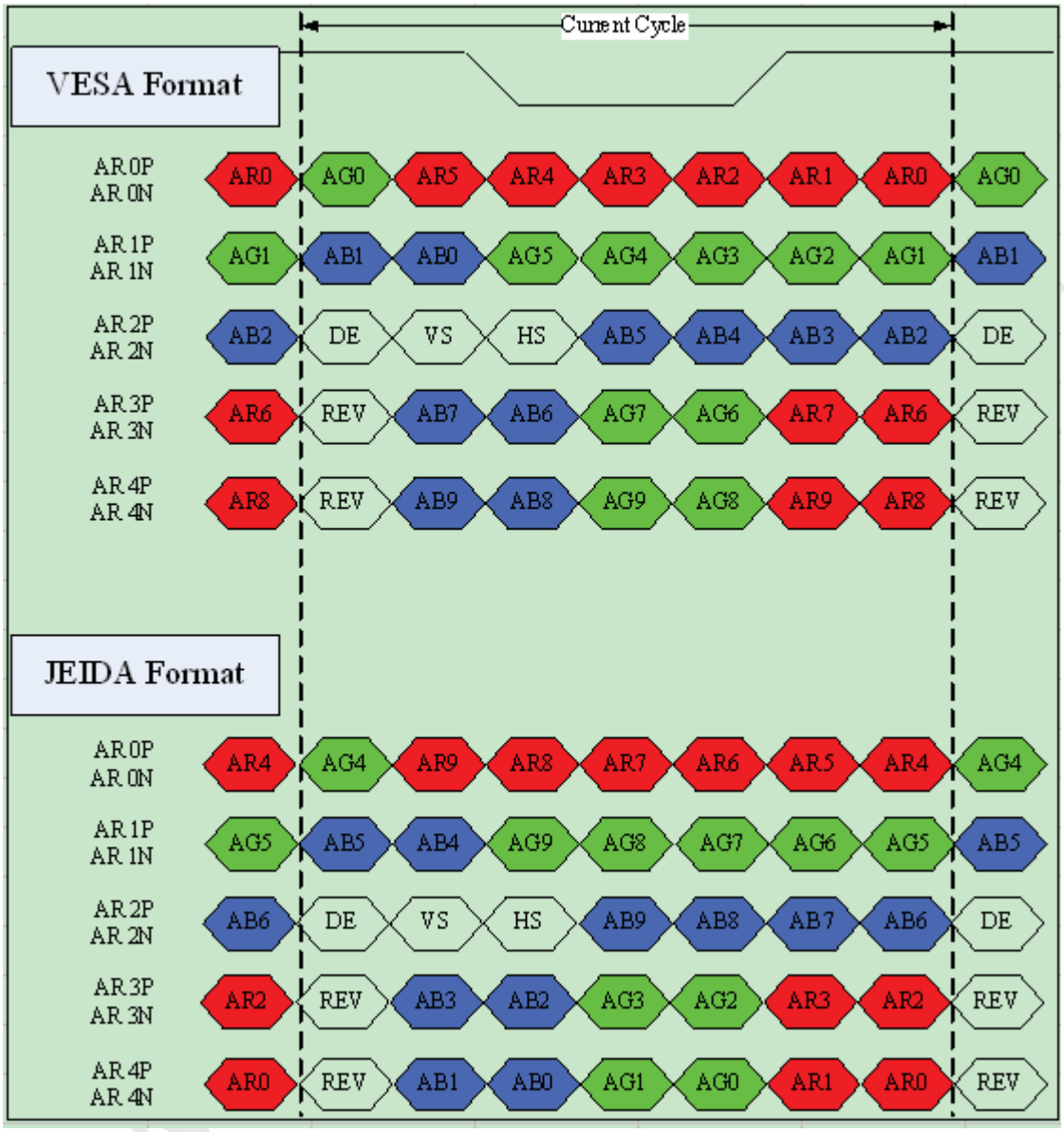
5.5 LVDS INTERFACE

JEDIA LVDS format：



R0~R9: Pixel R Data (9; MSB, 0; LSB)

G0~G9: Pixel G Data (9; MSB, 0; LSB)

B0~B9: Pixel B Data (9; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

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

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5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-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									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	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	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	1	1	1	1	1	1	1	1	1	1	0	0	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	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	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	1	1	0	0	0	0	0	0	0	0	0	0	1	1	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	1	1	1	1	0	0	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	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	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (1021)	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	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	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (1021)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	Green (1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	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	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	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	0	0	0	0	0	1	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (1021)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0
	Blue (1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
	Blue (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

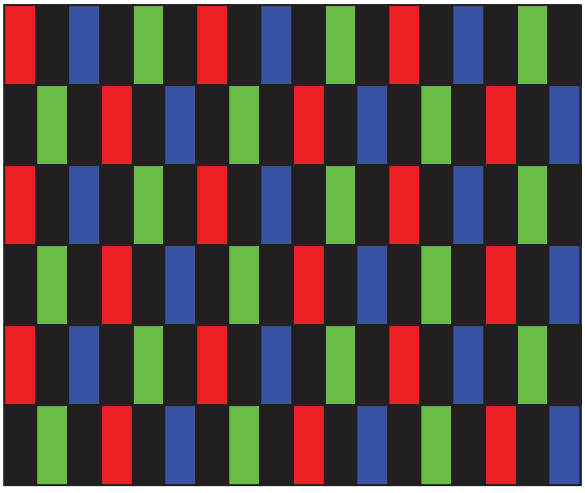
Note (1) 0: Low Level Voltage, 1: High Level Voltage

5.7 FLICKER (Vcom) ADJUSTMENT

(1) Adjustment Pattern:

dot-inversion pattern was shown as below. If customer need below pattern, please directly contact with Account FAE.

(bright sub-pixel：G128 ; dark sub-pixel：G0)



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(2) Adjustment method: (Digital V-com)

Programmable memory IC is used for Digital V-com adjustment in this model. CMI provide Auto Vcom tools to adjust Digital V-com.The detail connection and setting instruction, please directly contact with Account FAE or refer CMI Auto V-com adjustment OI. Below items is suggested to be ready before Digital V-com adjustment in customer LCM line.

a. USB Sensor Board.

b. Programmable software.

6. INTERFACE TIMING

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6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 ºC)

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

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

$$F_{clkin(max)} \geqq F_{r6} \times T_v \times T_h$$

$$F_{r5} \times T_v \times T_h \geqq F_{clkin(min)}$$

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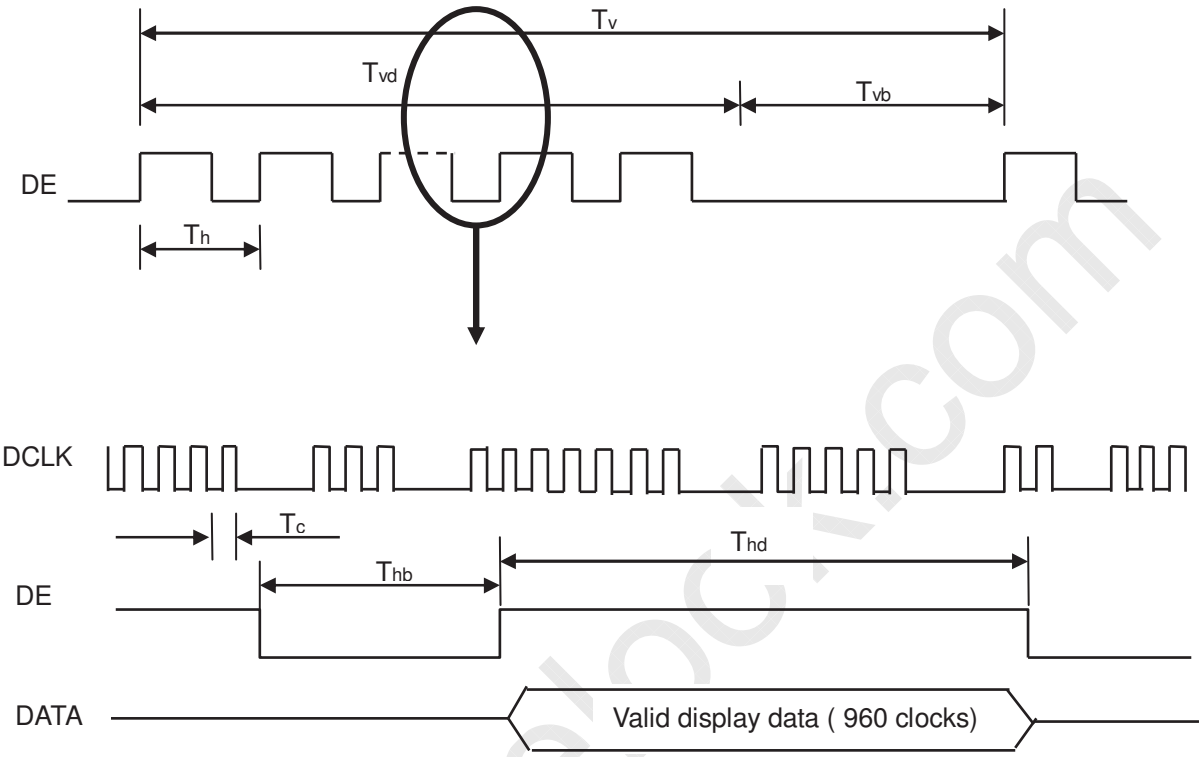
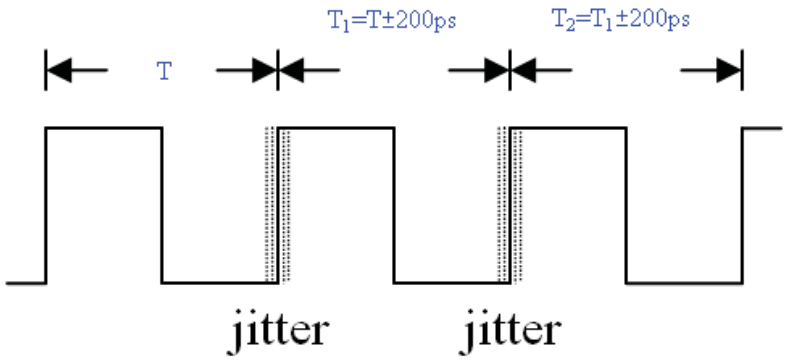
Note (2) This module is operated in DE only mode and please follow the input signal timing diagram below :

INPUT SIGNAL TIMING DIAGRAM



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



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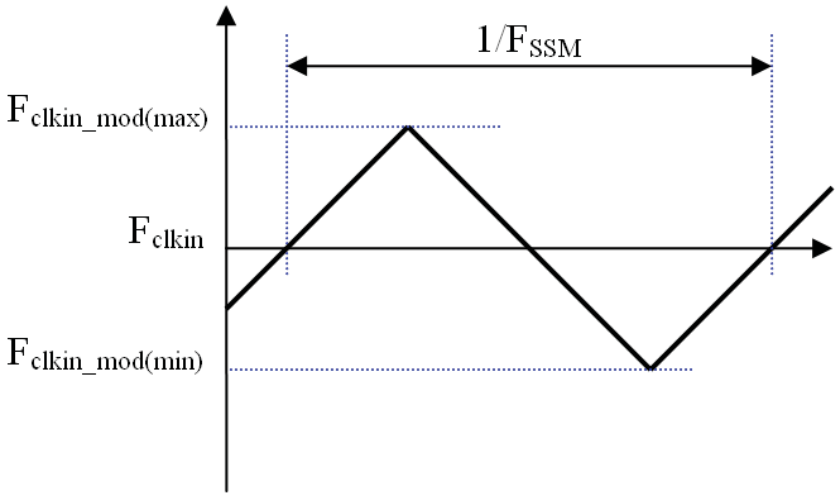
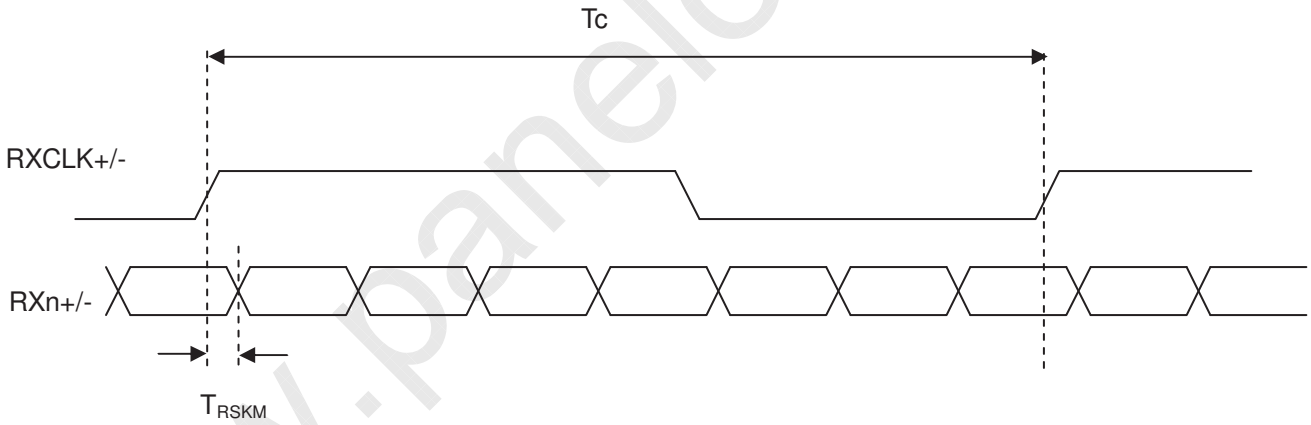
Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The LVDS timing diagram and the time of receiver skew margin is defined and showing as the following figures.

LVDS RECEIVER INTERFACE TIMING DIAGRAM



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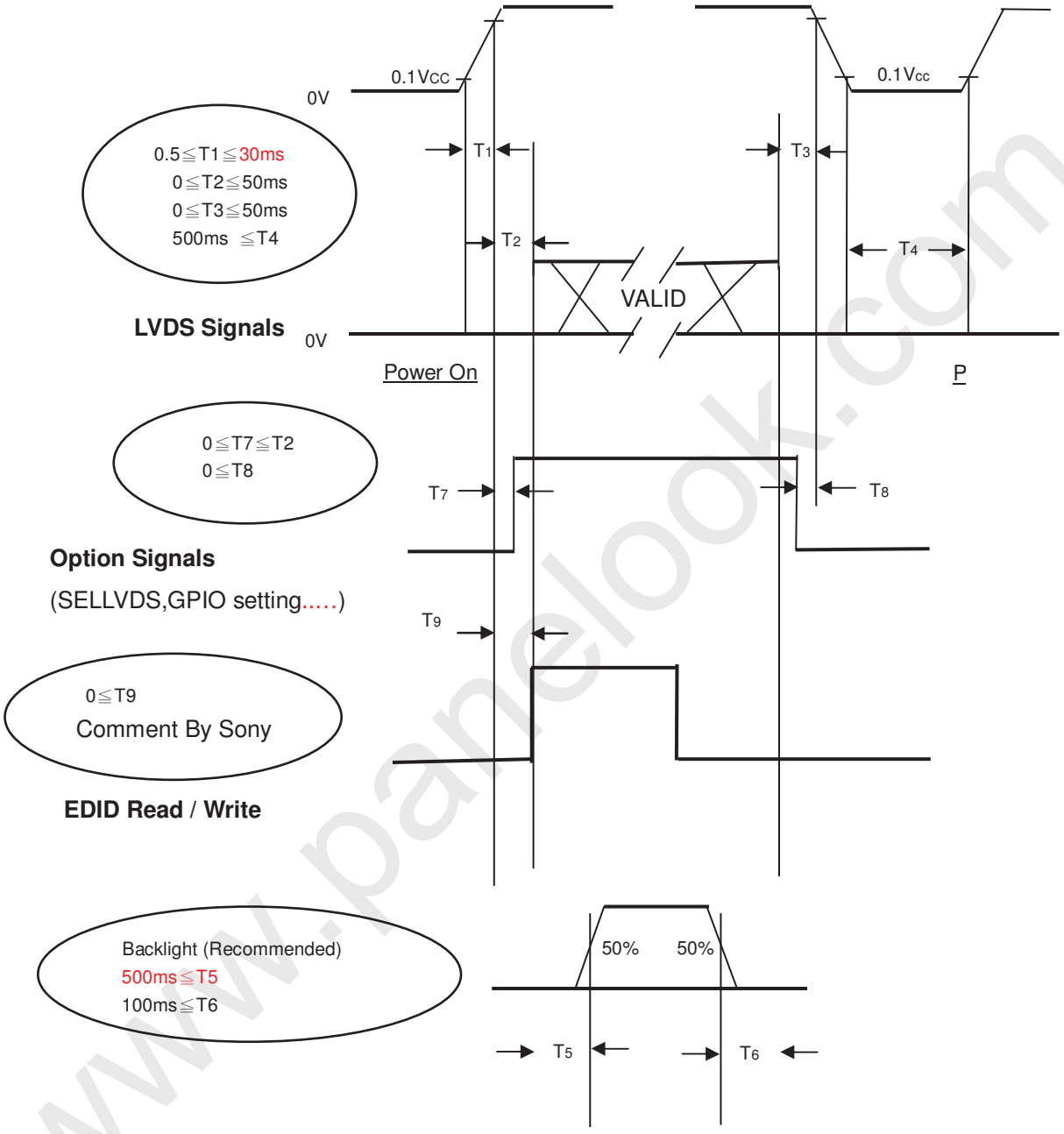
6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

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



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.

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.

Note (6) EDID read/write timing is OK at any time

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6.3 PANEL IDENTIFICATION (EDID)

EEPROM (24C02) Slave address: AA (1010 1010)

NO.	Item	Spec	Address	Data	Remark
1	Vendor code	CMI	00	02	
2	Screen size	65”	01	41	Hex
3	H-Resolution	1920	02,03	07,80	Hex
4	V-Resolution	1080	04,05	04,38	Hex
5	V-Frequency	200/240Hz	06	02	Note(1)
6	Data format	10 bit	07	02	Note(1)
7	Part number	V645HQ1-PE1	E0~EF	56,36,34,35,48,51,31,2D,50,45,31,00,00,00,00,00	ASCOO

Note (1) Definition

Data	Note2) V-Frequency
00	50/60Hz
01	100/120Hz
02	200/240Hz

Data	Note3) Data format
00	6bit
01	8bit
02	10bit

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7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Current	I_L	110	mA

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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 7.1.

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θx=0°, θy =0° Viewing angle at normal direction	4000	5000	-	-	(2)
Response Time		T_R		-	25	-	ms	(3)
		T_F		-	4	-	ms	
Response Time		Gray to gray		-	5.5	-	ms	-
White Variation		δW		-	-	0.3	-	(6)
Center Luminance of White		L_C		350	440	-	cd/m	(4)
Cross Talk		CT		-	-	4	%	(5)
Color Chromaticity	Red	Rx		Typ.-0.03	0.640	Typ.+0.03	-	(7)
		Ry			0.333		-	
	Green	Gx			0.290		-	
		Gy			0.593		-	
	Blue	Bx			0.148		-	
		By			0.055		-	
	White	Wx			0.280		-	
		Wy			0.285		-	
	Color Gamut	C.G		-	72	-	%	NTSC
Viewing Angle	Horizontal	θx+	CR≥20	80	88	-	Deg.	(1)
		θx-		80	88	-		
	Vertical	θY+		80	88	-		
		θY-		80	88	-		

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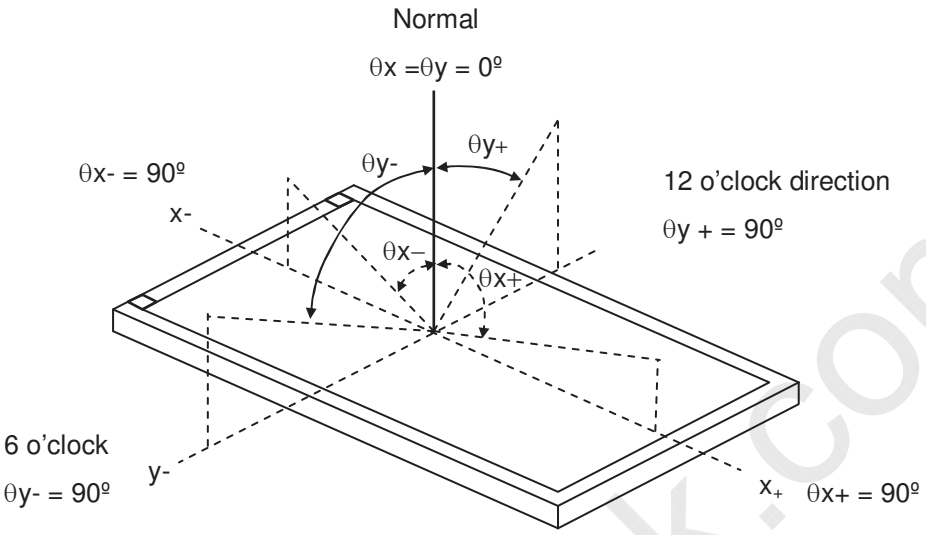
Note (1) Definition of Viewing Angle (θx, θy) :

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.

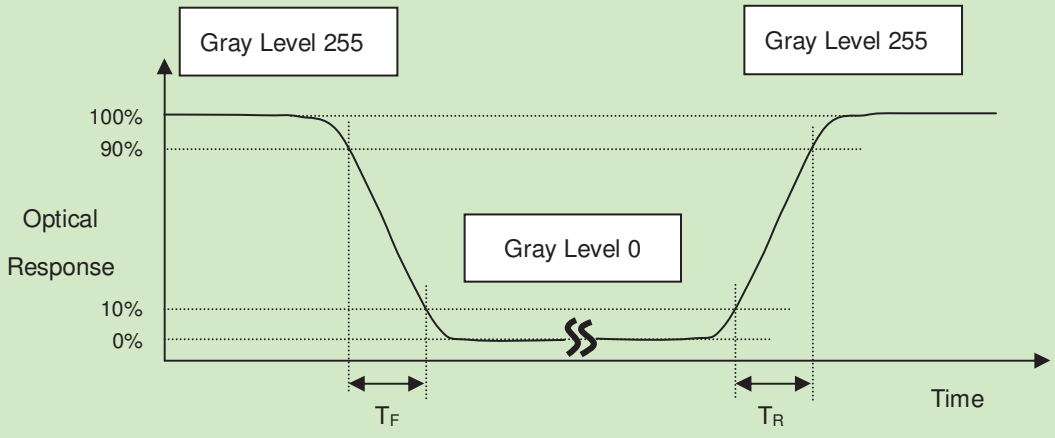
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



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The driving signal means the signal of gray level 32, 64 , 96, 128, 160, 192 and 224

Gray to gray average time means the average switching time of gray level 32, 64 , 96, 128, 160, 192 and 224 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), where L (X) is corresponding to the luminance of the point X at the figure in Note (6).

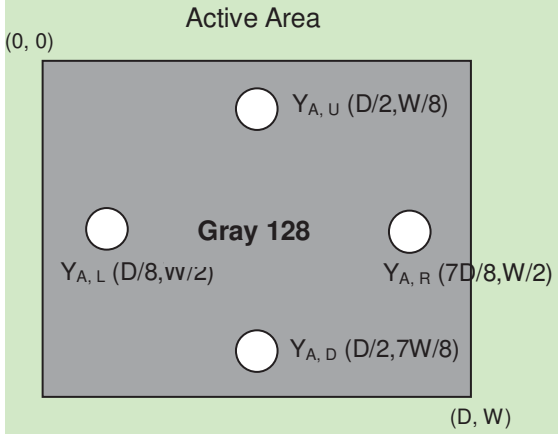
Note (5) Definition of Cross Talk (CT):

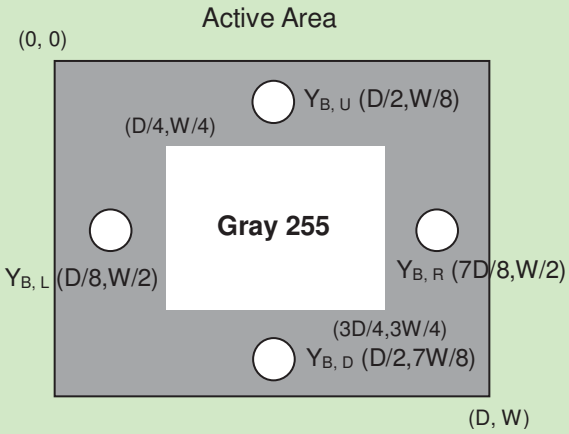
$CT = | Y_B - Y_A | / Y_A \times 100$ (%)

Where:

Y_A = Luminance of measured location without gray level 255 pattern (cd/m2)

Y_B = Luminance of measured location with gray level 255 pattern (cd/m2)





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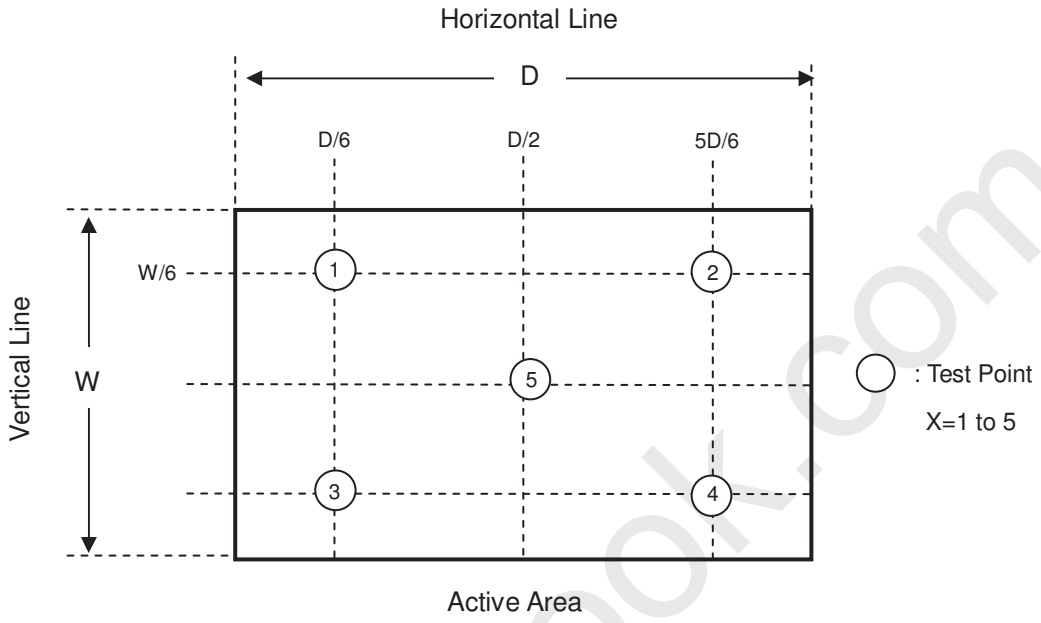
Note (6) Definition of White Variation (δW):

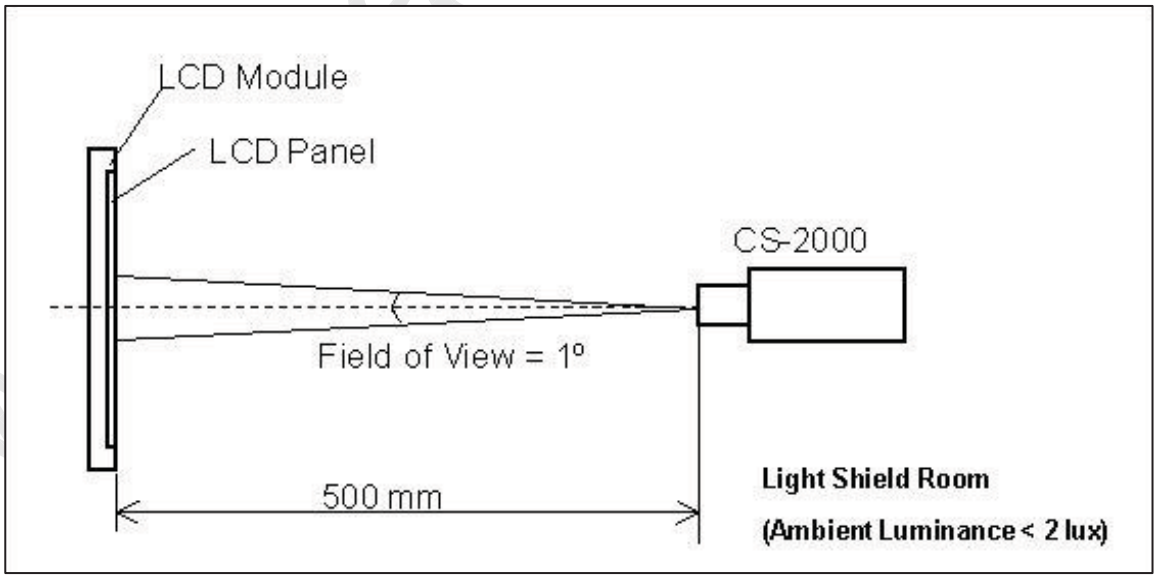
Measure the luminance of gray level 255 at 5 points

δW = 1-{Minimum [L (1), L (2), L (3), L (4), L (5)] / Maximum [L (1), L (2), L (3), L (4), L (5)]}



Note (7) 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. (Tcon board is at bottom side.)



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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 CMIS LSI chips.

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

[6] Do not disassemble the module.

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

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

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

[9.1] 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℃at normal humidity without condensation.

[9.2] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

[10] When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

8.2 SAFETY PRECAUTIONS

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

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

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

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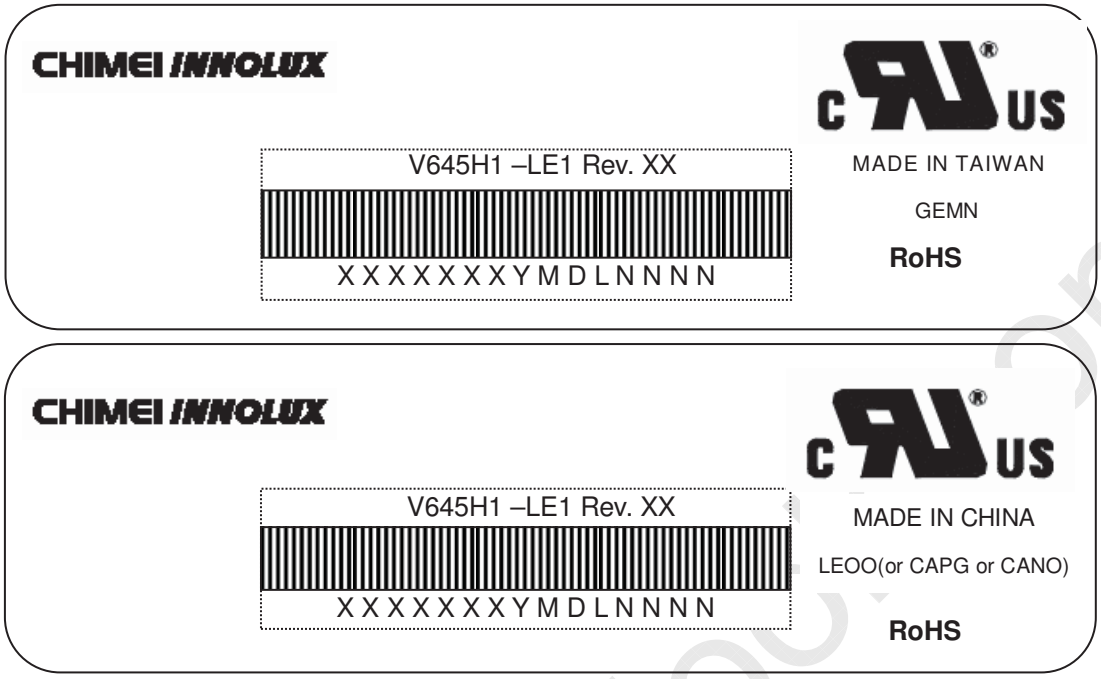
9. DEFINITION OF LABELS

9.1 CMI MODULE LABEL

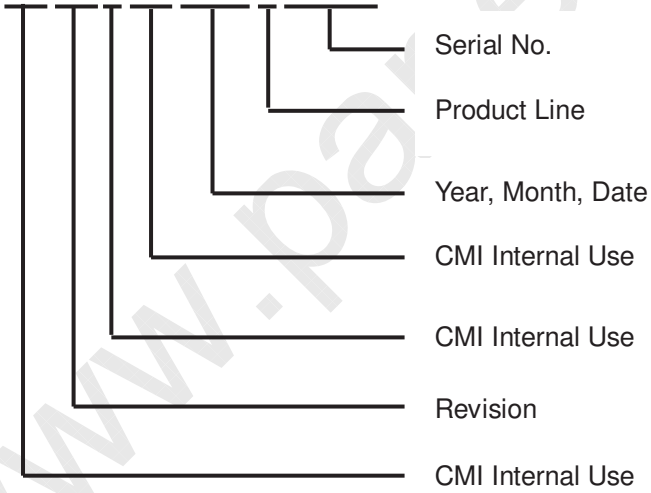
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



Model Name: V645H1-LE1

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

Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

Manufactured Date:

Year : 2001=1, 2002=2, 2003=3, 2004=4…2010=0, 2011=1, 2012=2…

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

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

Revision Code : Cover all the change

Serial No. : Manufacturing sequence of product

Product Line : 1 → Line1, 2 → Line 2, …etc.

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10. PACKAGING

10.1 PACKAGING SPECIFICATIONS

(1) 2 LCD TV modules / 1 Box

(2) Box dimensions : 1645(L)x282(W)x982(H)mm

(3) Weight : Approx. 62.2Kg(2 modules per carton)

10.2 PACKAGING METHOD

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

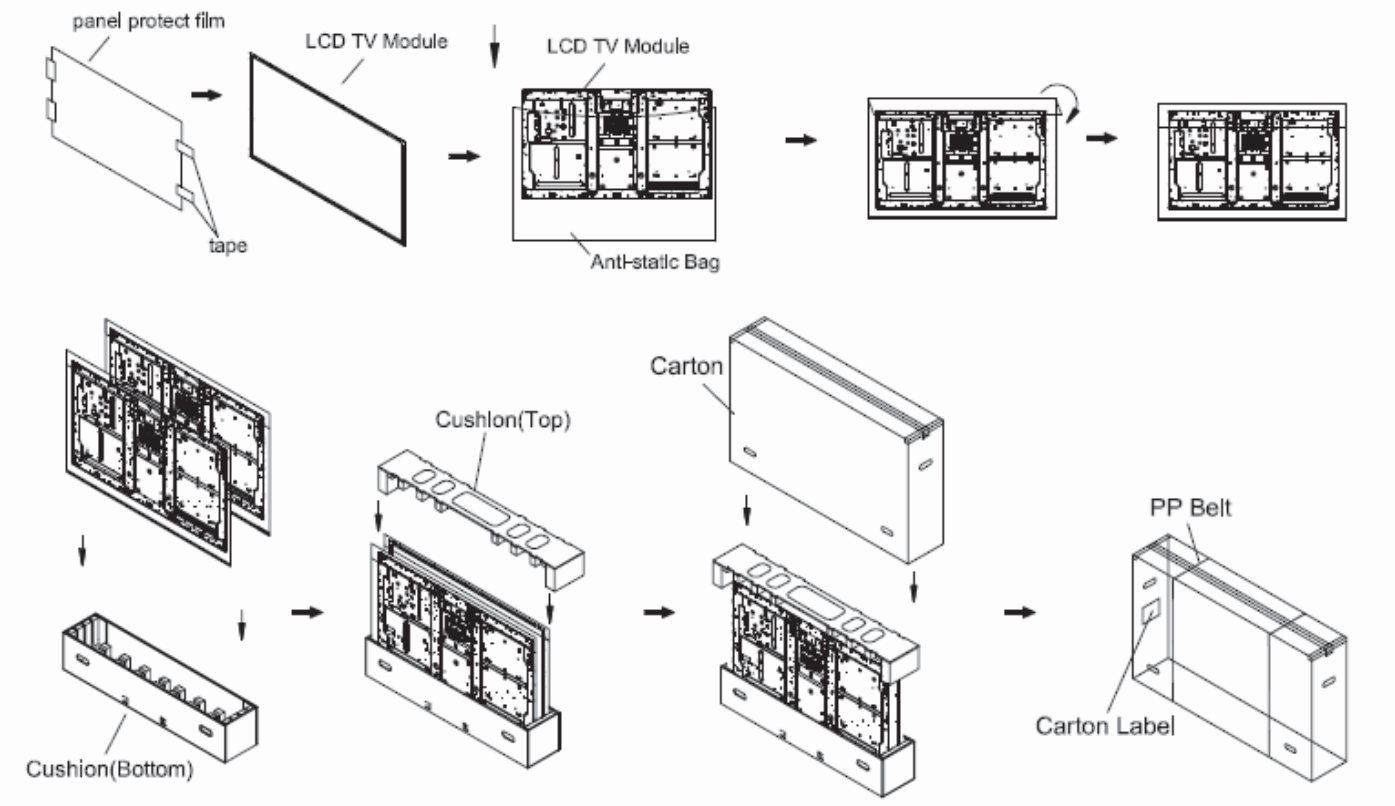

Figure 10-1 packing method

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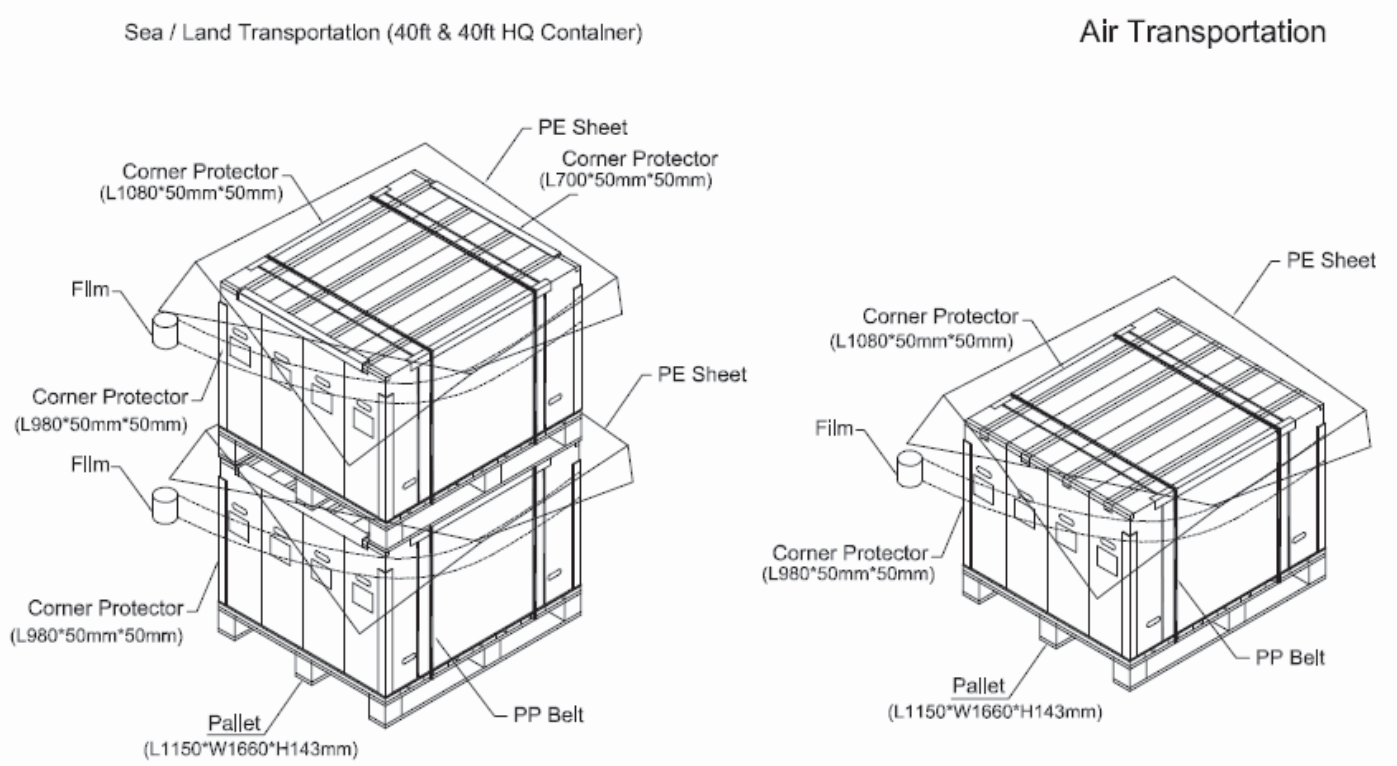

Figure 10-2 packing method

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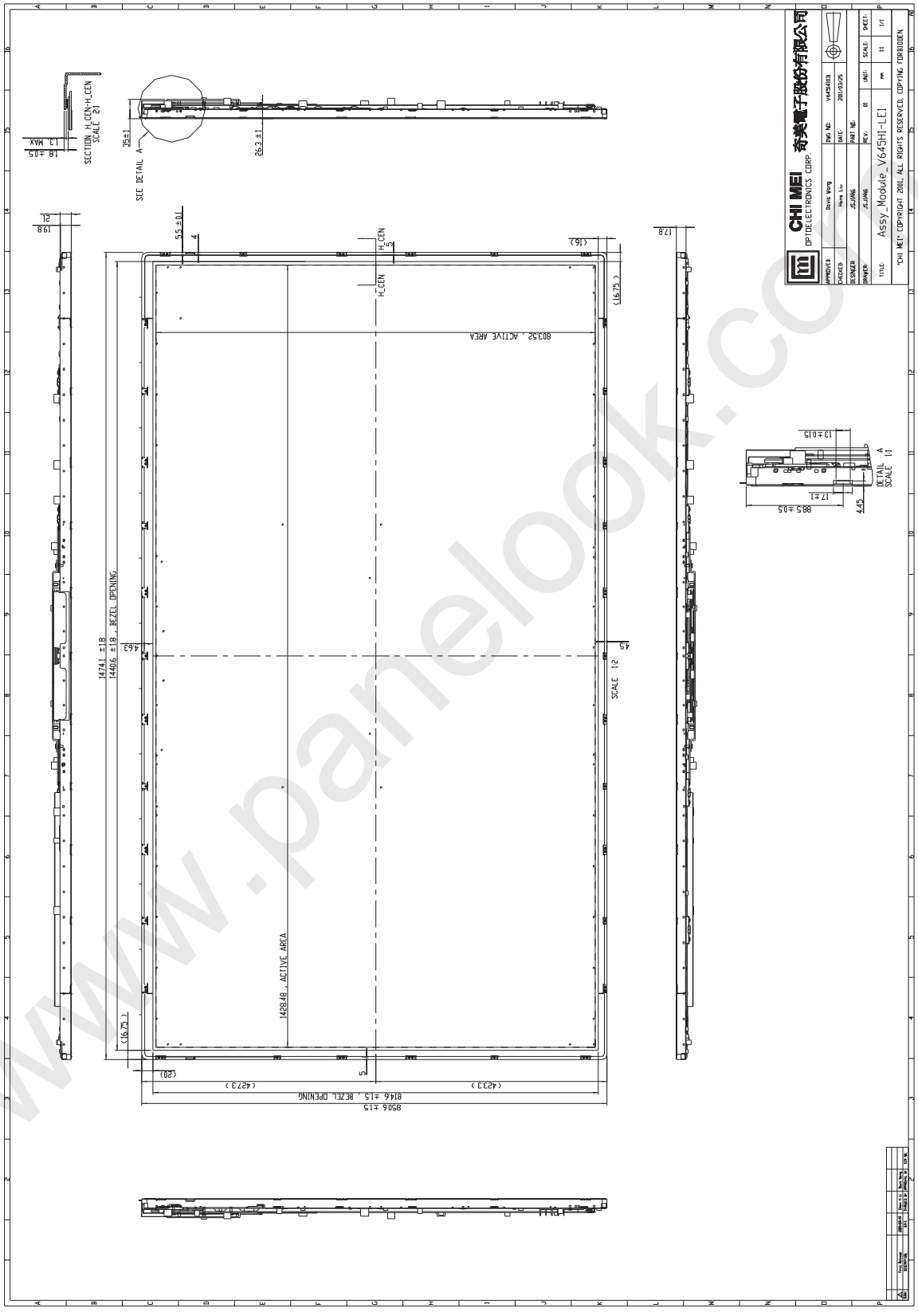
11. MECHANICAL CHARACTERISTIC



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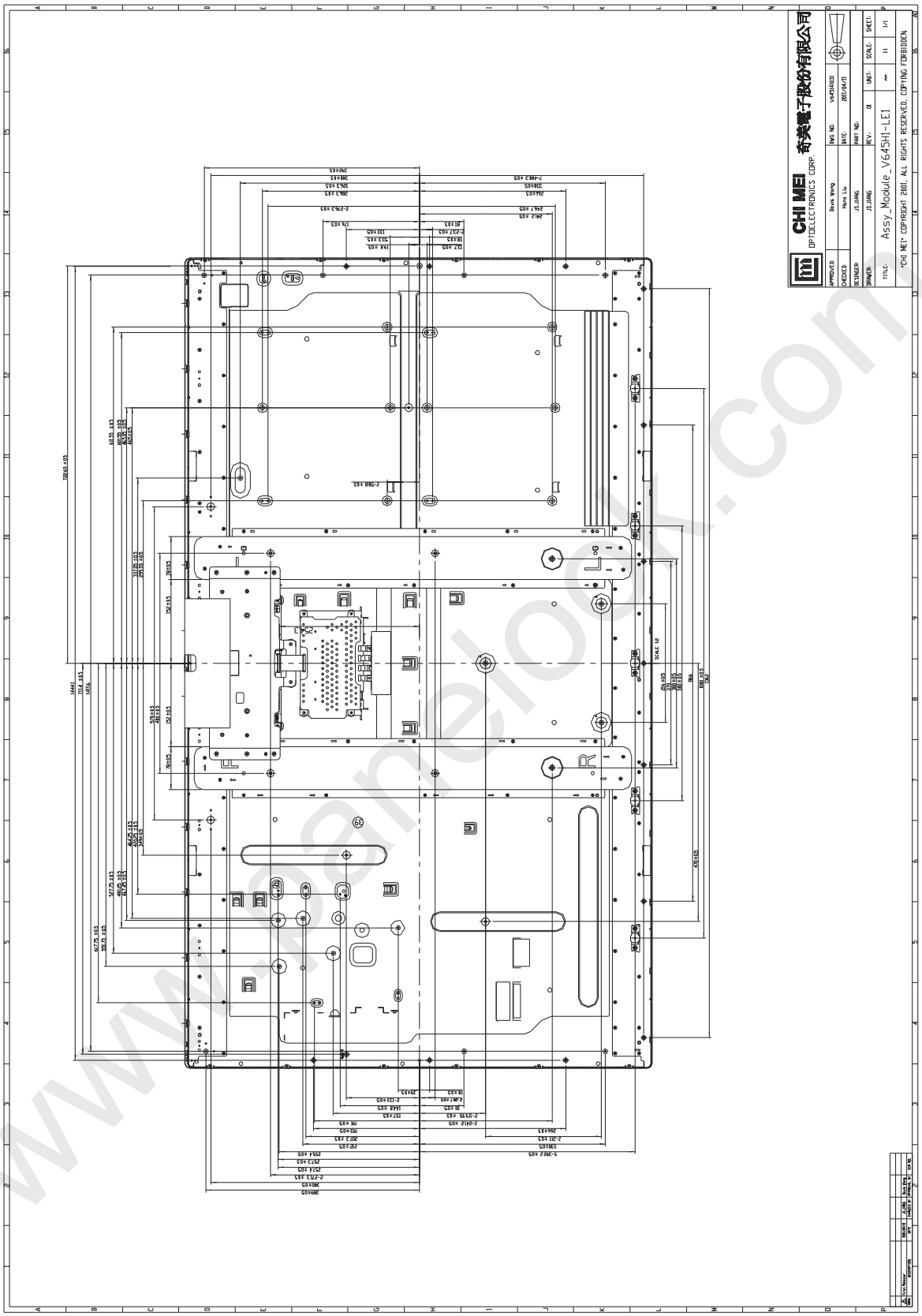

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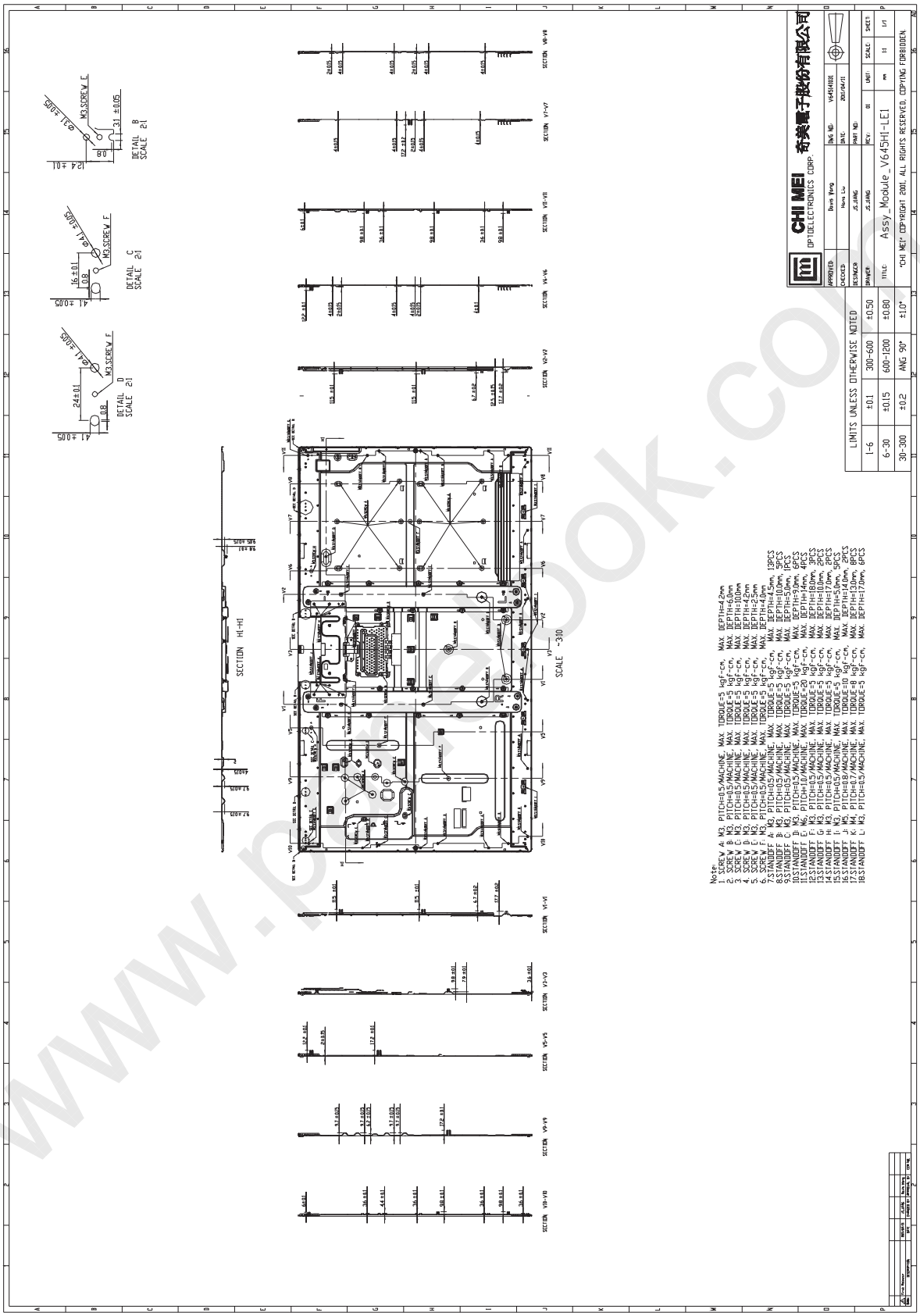

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