Product Specification

CUSTOMER 客　　户：	
PRODUCT 产品名称：	65" TFT LCD
MODEL NO. 产品型号：	LC650EQC-SMA3
ISSUED DATE 发布日期：	2025-02-25

PREPARED BY 制作	REVIEWED BY 审核	APPROVED BY 批准

广东宏浩源技术有限公司

地址：广东省佛山市顺德区杏坛镇顺业西路15号中集智谷7栋3号门506

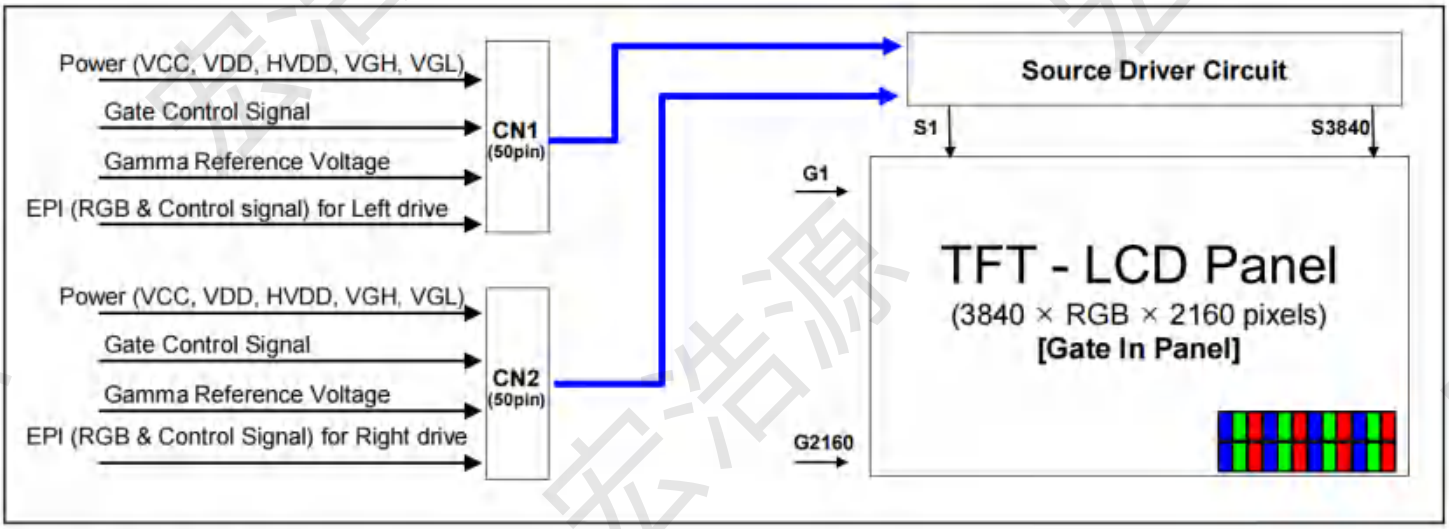
CONTENTS

REVISION HISTORY

Version	Revision Date	Page	Description
Ver1.0	2025-02-25	--	LC650EQC-SMA3 Preliminary specification was first issued

1. General Description

The LC650EQC is a Color Active Matrix Liquid Crystal Display with an integral the Source PCB and Gate implanted on Panel (GIP). The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 64.53 inch diagonally measured active display area with QWUXGA resolution (2160 vertical by 3840 horizontal pixel array). Each pixel is divided into Red, Green, and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 10-bit gray scale signal for each dot. Therefore, it can present a palette of more than 1.07B colors.
It has been designed to apply the 10-bit 8 Lane VbyOne interface.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

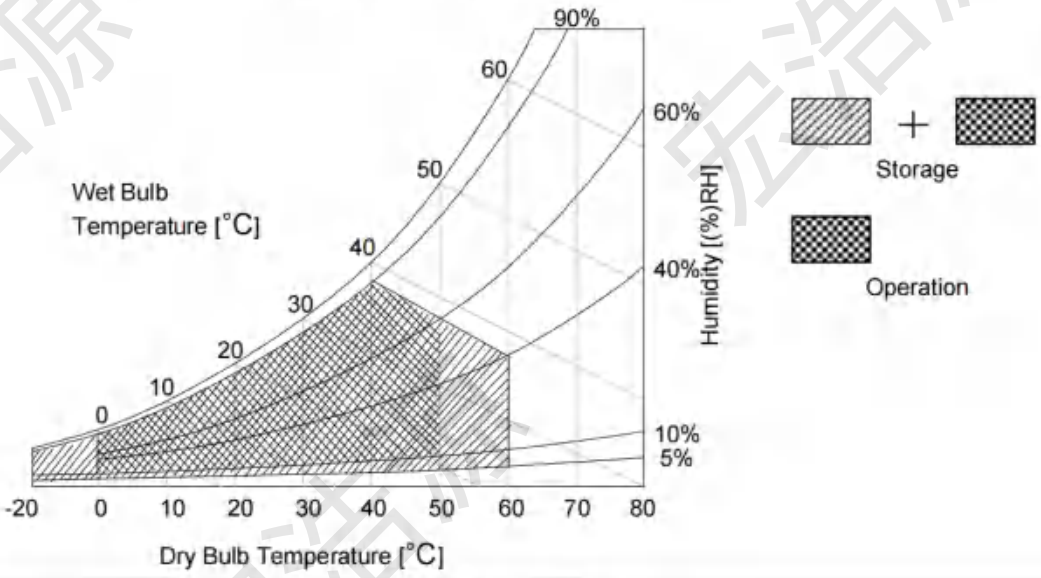
Active Screen Size	64.53 inches diagonal
Outline Dimension	1440.3(H) x 817.9 (V) x 1.2mm(D) (Typ.)
Pixel Pitch	0.372 mm x 0.372 mm
Pixel Format	3840 horiz. by 2160 vert.
Display Mode	IPS
Color Depth	10-bit(D), 1.07 Billion colors
Drive IC Data Interface	Source D-IC : 8-bit EPI, gamma reference voltage, and control signals Gate D-IC : Gate In Panel
Transmittance(with POL)	5.51%(Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Min.), U/D 178 (Min.))
Power Consumption	Logic= 14W (Typ.), 18.2W (Max.)
Weight	3.2Kg (Typ.) , 3.36Kg(Max.)
Display Mode	Transmissive mode, Normally black
Surface Treatment (Top)	Hard coating(2H), Anti-glare low reflection treatment of the front polarizer (Haze 3%(Typ.)

2. Absolute Maximum Ratings

The following items are maximum values which, if exceeded, may cause faulty operation or permanent damage to the LCD module.

Parameter	Symbol	Value		Unit	Note
		Min	Max		
Logic & EPI Power Voltage	VCC	-0.5	+2.2	VDC	1
Gate High Voltage	VGH	+18.0	+30.0	VDC	
Gate Low Voltage	VGL1	-8.0	-4.0	VDC	
	VGL2	-16.0	-4.0		
Source D-IC Analog Voltage	VDD	-0.3	+18.0	VDC	
Gamma Ref. Voltage (Upper)	VGMH	½VDD-0.3	VDD+0.5	VDC	
Gamma Ref. Voltage (Low)	VGML	-0.3	½ VDD+0.3	VDC	
Panel Front Temperature	TPT	-	+68	°C	3
Operating Temperature	TOP	0	+50	°C	2
Storage Temperature	TST	-20	+60	°C	
Operating Ambient Humidity	HOP	10	90	%RH	
Storage Humidity	HST	5	90	%RH	

Note 1. Ambient temperature condition (Ta = 25 ± 2 °C)
2. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be Max 39°C, and no condensation of water. .
3. The maximum operating temperatures is based on the test condition that the surface temperature of display area is less than or equal to 68°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 68℃. The range of operating temperature may be degraded in case of improper thermal management in final product design.



3. Electrical Specifications

3-1. Electrical Characteristics

It requires several power inputs. The VCC is the basic power of LCD Driving power sequence, Which is used to logic power voltage of Source D-IC and GIP.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	MIN	TYP	MAX	Unit	Note
Logic & EPI Power Voltage	VCC	-	1.79	1.88	1.98	VDC	
Logic High Level Input Voltage	VIH	-	1.5	-	VCC	VDC	
Logic Low Level Input Voltage	VIL	-	0	-	0.4	VDC	
Source D-IC Analog Voltage	VDD	-	16.4	16.6	16.8	VDC	
Half Source D-IC Analog Voltage	H_VDD	-	8.1	8.3	8.5	VDC	7
Gamma Reference Voltage	V_{GMH}	(GMA1 ~ GMA9)	H_VDD+0.2V	-	VDD-0.2	VDC	
	V_{GML}	(GMA10 ~ GMA18)	0.2	-	H_VDD-0.2V	VDC	
Common Voltage	Vcom	Reverse	Typ.-500mV	5.3	Typ.+500mV	V	
Vterm	Vterm	CML Type Vcore_tx=1.0V ~ 1.2V	1.05	1.1	1.15	V	6
EPI input common voltage	VCM	CML Type	0.75	-	Vterm – Vdiff/2	V	
EPI input differential voltage	Vdiff	-	150	-	500	mV	
EPI Input eye diagram	Veye	-	90	-	-	mV	
Gate High Voltage	VGH	@ 25℃	29.7	30	30.3	VDC	
		@ 0℃	29.7	30	30.3	VDC	
Gate Low Voltage	VGL1	–	-7.2	-7.0	-6.8	VDC	
	VGL2	–	-15.2	-15.0	-14.8	VDC	
GIP Bi-Scan Voltage	VGI_P	-	VGL	-	-	VDC	
	VGI_N	-	-	-	VGH	VDC	
GIP Refresh Voltage	VGH even/odd	-	VGL	-	VGH	V	
GIP Start Pulse Voltage	VST	-	VGL	-	VGH	V	
GIP Operating Clock	GCLK	-	VGL	-	VGH	V	
Total Power Current	ILCD	-	-	1160	1510	mA	1
		-	-	2500	3250	mA	2
Total Power Consumption	PLCD	-	-	14	18.1	Watt	1
		-	-	30	39	Watt	2

Note: 1. The specified current and power consumption are under the V_{LCD}=12V., 25 ± 2°C, f_V=60Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The current is specified at the maximum current pattern.
3. The above spec is based on the basic model.
4. All of the typical gate voltage should be controlled within 1% voltage level
5. Ripple voltage level is recommended under ±5% of typical voltage
6. In case of EPI signal spec, refer to Fig 2 for the more detail.
7. HVDD Voltage level is half of VDD and it should be between Gamma9 and Gamma10.

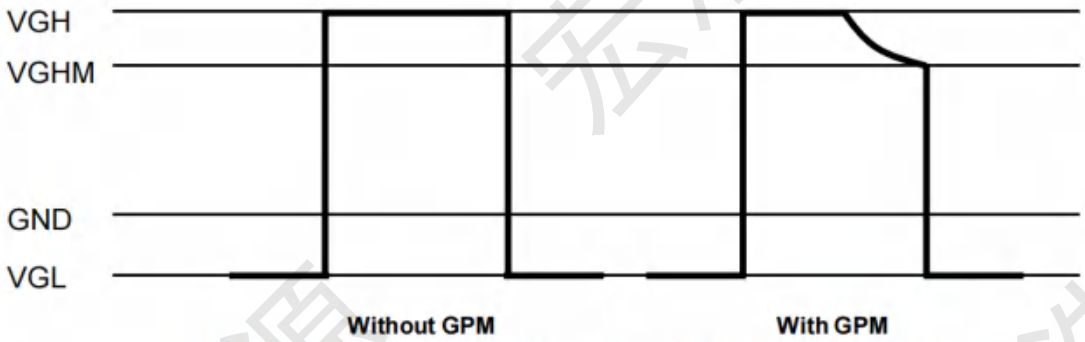


FIG. 1 Gate Output Wave form without GPM and with GPM

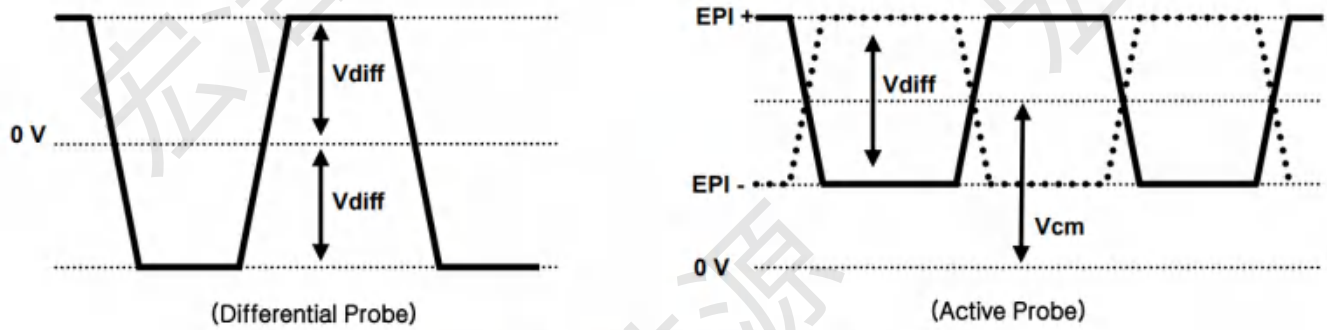


FIG. 2-1 EPI Differential signal characteristics

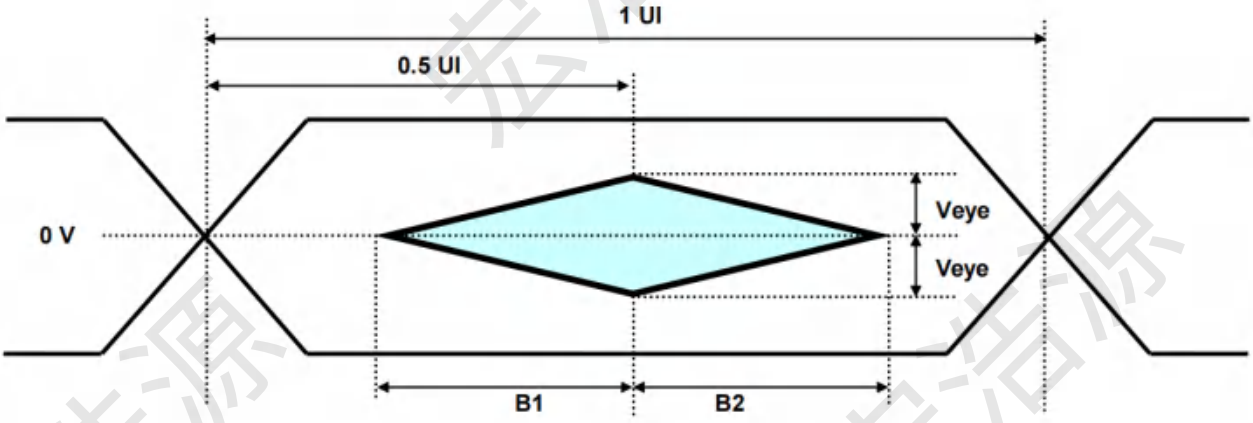


FIG. 2-2 Eye Pattern of EPI Input

*Source PCB

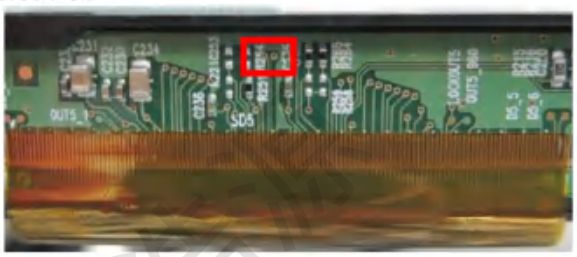


FIG. 3 Measure point

3-2. Interface Connections

This LCD module employs two kinds of interface connection, two 60-pin FFC connector are used for the module electronics and 8-pin / 8-pin connectors are used for the integral backlight system.

3-2-1. LCD Module

-LCD Connector(CN3): TF49-60S-0.5SH (manufactured by HIROSE)

Table 3-1. MODULE CONNECTOR(CN1) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	CLK1	GIP GATE Clock 1	31	GND	Ground
2	CLK2	GIP GATE Clock 2	32	EPi4-	EPI Receiver Signal 4-
3	CLK3	GIP GATE Clock 3	33	EPI4+	EPI Receiver Signal 4+
4	CLK4	GIP GATE Clock 4	34	GND	Ground
5	CLK5	GIP GATE Clock 5	35	EPi3-	EPI Receiver Signal 3-
6	CLK6	GIP GATE Clock 6	36	EPI3+	EPI Receiver Signal 3+
7	CLK7	GIP GATE Clock 7	37	GND	Ground
8	CLK8	GIP GATE Clock 8	38	EPI2-	EPI Receiver Signal 2-
9	CLK9	GIP GATE Clock 9	39	EPI2+	EPI Receiver Signal 2+
10	CLK10	GIP GATE Clock 10	40	GND	Ground
11	VGH	HIGH VOLTAGE for Panel GIP Pre-Charging	41	EPI1-	EPI Receiver Signal 1-
12	VGH_ODD	HIGH PULSE VOLTAGE for Panel GIP VDD of ODD	42	EPI1+	EPI Receiver Signal 1+
13	VGH_EVEN	HIGH PULSE VOLTAGE for Panel GIP VDD of EVEN	43	GND	Ground
14	VGL2	Low Voltage for GIP Holding	44	V18	GAMMA VOLTAGE 18
15	GIP_RST	PULSE for GIP RESET	45	V15	GAMMA VOLTAGE 15
16	VST	VERTICAL START PULSE	46	V14	GAMMA VOLTAGE 14
17	VGL1	LOW VOLTAGE for TFT GATE Holding	47	V13	GAMMA VOLTAGE 13
18	VCOM_L_T	VCOM Left Top Input	48	V10	GAMMA VOLTAGE 10
19	VCOM_L_FB	VCOM Left Feed-Back Output	49	V9	GAMMA VOLTAGE 9
20	VCOM_L_B	VCOM Left Bottom Input	50	V6	GAMMA VOLTAGE 6
21	GND	Ground	51	V5	GAMMA VOLTAGE 5
22	VDD	Driver Power Supply Voltage	52	V4	GAMMA VOLTAGE 4
23	VDD	Driver Power Supply Voltage	53	V1	GAMMA VOLTAGE 1
24	VDD	Driver Power Supply Voltage	54	FLASH_WP	Write protection for Flash memory
25	VDD	Driver Power Supply Voltage	55	FLASH_DO	Signal for Flash memory
26	HVDD	Half Driver Power Supply Voltage	56	FLASH_CS	Signal for Flash memory
27	VCC18	Logic & EPI Power Voltage	57	FLASH_DI	Signal for Flash memory
28	VCC18	Logic & EPI Power Voltage	58	GND	Ground
29	VCC12	Vterm Power Voltage	59	FLASH_CLK	Signal for Flash memory
30	Lock_O	LOCKOUT4	60	VCC33	Flash memory Power voltage

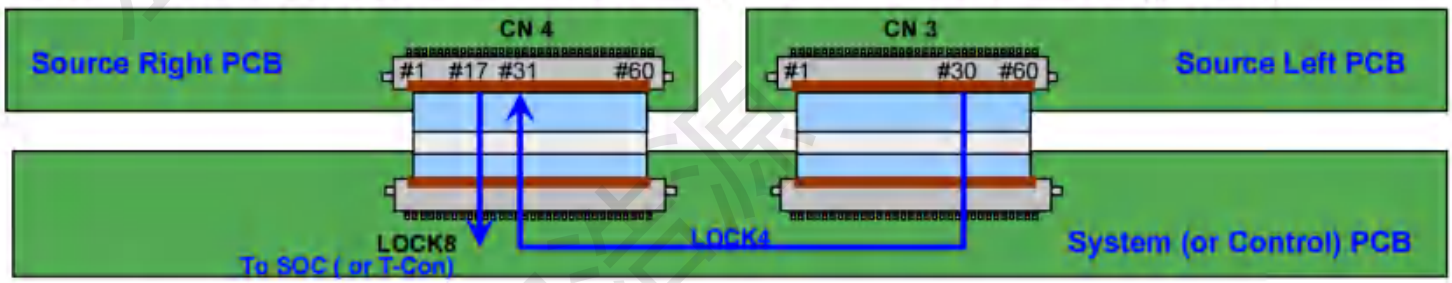
notes : 1. Please refer to application notes for details.
(GIP & Half VDD & Gamma Voltage setting)

- LCD Connector(CN4): TF49-60S-0.5SH (manufactured by HIROSE)

Table 3-2. MODULE CONNECTOR(CN2) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	NC	No Connection	31	LOCK_I	LOCKIN4
2	NC	No Connection	32	Vterm	Vterm Power Voltage
3	NC	No Connection	33	VCC_18	Logic & EPI Power Voltage
4	NC	No Connection	34	VCC_18	Logic & EPI Power Voltage
5	GND	Ground	35	H_VDD	Half Driver Power Supply Voltage
6	GMA18	GAMMA VOLTAGE 18	36	VDD	Driver Power Supply Voltage
7	GMA15	GAMMA VOLTAGE 15	37	VDD	Driver Power Supply Voltage
8	GMA14	GAMMA VOLTAGE 14	38	VDD	Driver Power Supply Voltage
9	GMA12	GAMMA VOLTAGE 13	39	VDD	Driver Power Supply Voltage
10	GMA10	GAMMA VOLTAGE 10	40	GND	Ground
11	GMA9	GAMMA VOLTAGE 9	41	VCOM_R_B	VCOM Right Bottom Input
12	GMA7	GAMMA VOLTAGE 6	42	VCOM_R_FB	VCOM Right Feed-Back Output
13	GMA5	GAMMA VOLTAGE 5	43	VCOM_R_T	VCOM Right Top Input
14	GMA4	GAMMA VOLTAGE 4	44	VGL1	LOW VOLTAGE for TFT GATE Holding
15	GMA1	GAMMA VOLTAGE 1	45	VST	VERTICAL START PULSE
16	GND	Ground	46	GIP_Reset	GIP Panel for Reset
17	LOCK_O	LOCKOUT8	47	VGL2	Low Voltage for GIP Holding
18	GND	Ground	48	VGH_EVEN	HIGH PULSE VOLTAGE for Panel GIP VDD of EVEN
19	EPI8-	EPI Receiver Signal(8-)	49	VGH_ODD	HIGH PULSE VOLTAGE for Panel GIP VDD of ODD
20	EPI8+	EPI Receiver Signal(8+)	50	VGH	HIGH VOLTAGE for Panel GIP Pre-Charging
21	GND	Ground	51	CLK10	GIP GATE Clock 10
22	EP7-	EPI Receiver Signal(7-)	52	CLK9	GIP GATE Clock 9
23	EP7+	EPI Receiver Signal(7+)	53	CLK8	GIP GATE Clock 8
24	GND	Ground	54	CLK7	GIP GATE Clock 7
25	EPI6-	EPI Receiver Signal(6-)	55	CLK6	GIP GATE Clock 6
26	EPI6+	EPI Receiver Signal(6+)	56	CLK5	GIP GATE Clock 5
27	GND	Ground	57	CLK4	GIP GATE Clock 4
28	EP5-	EPI Receiver Signal(5-)	58	CLK3	GIP GATE Clock 3
29	EP5+	EPI Receiver Signal(5+)	59	CLK2	GIP GATE Clock 2
30	GND	Ground	60	CLK1	GIP GATE Clock 1

notes : 1. Please refer to application notes for details. (GIP & Half VDD & Gamma Voltage setting)



3-3. Signal Timing Specifications

Table 4. Timing Requirements

Parameter	Symbol	Condition	Min	Typ	Max	Unit	notes
Unit Interval	UI	-	0.33	-	0.67	ns	
Effective Veye width time	B1&B2	-	0.25	-	-	UI	Fig. 2
Modulation Ratio of SSC	Vspread	@100KHz	-	-	1	%	1
1st data to SOE rising time	Ts1	-	3	-	-	Packet	Fig.4
SOE rising to last data	Ts4		0	-	-	Packet	Fig.4
Last data to SOE falling	Ts5	-	10	-	-	Packet	Fig.4
EPI Bandwidth	BW	-	2.0	-	3.05	GBPS	

notes : 1. VModulation Ratio of SSC for 20KHz ~ 100kHz Modulation Frequency is calculated by (7 – 0.05*Fmod), where Fmod unit is KHz.

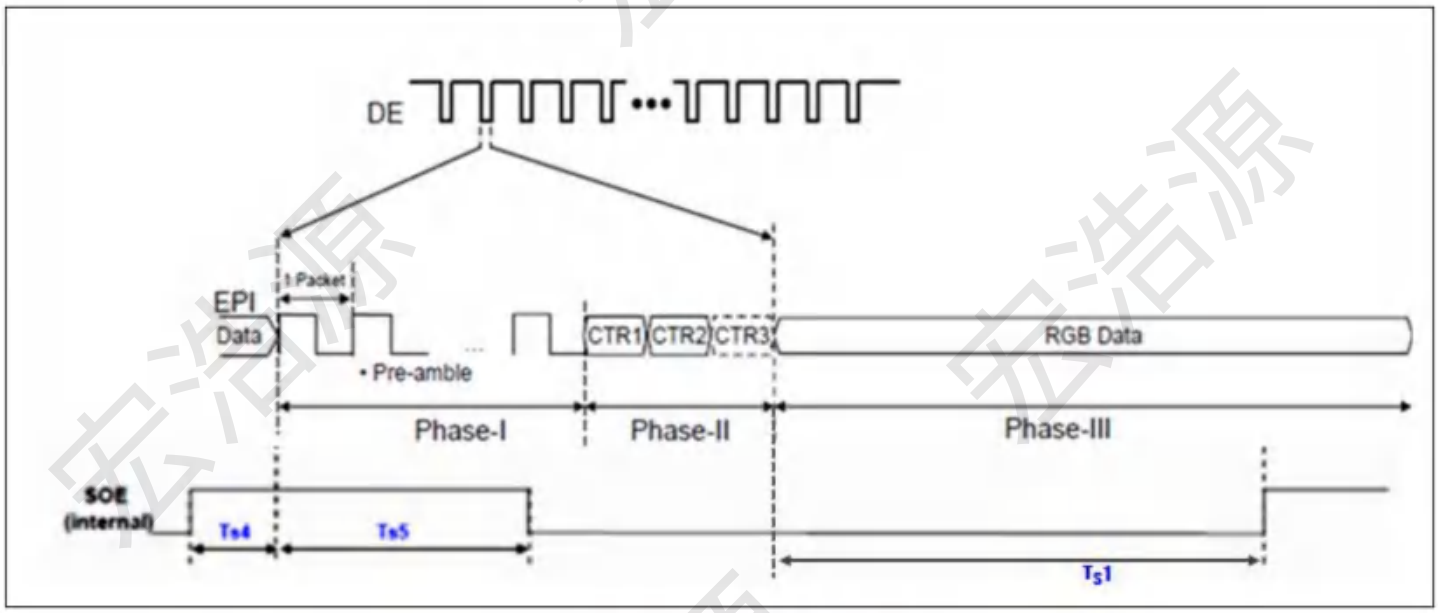


FIG 4. SOE Width & Timing

3-4. Panel Pixel Structure

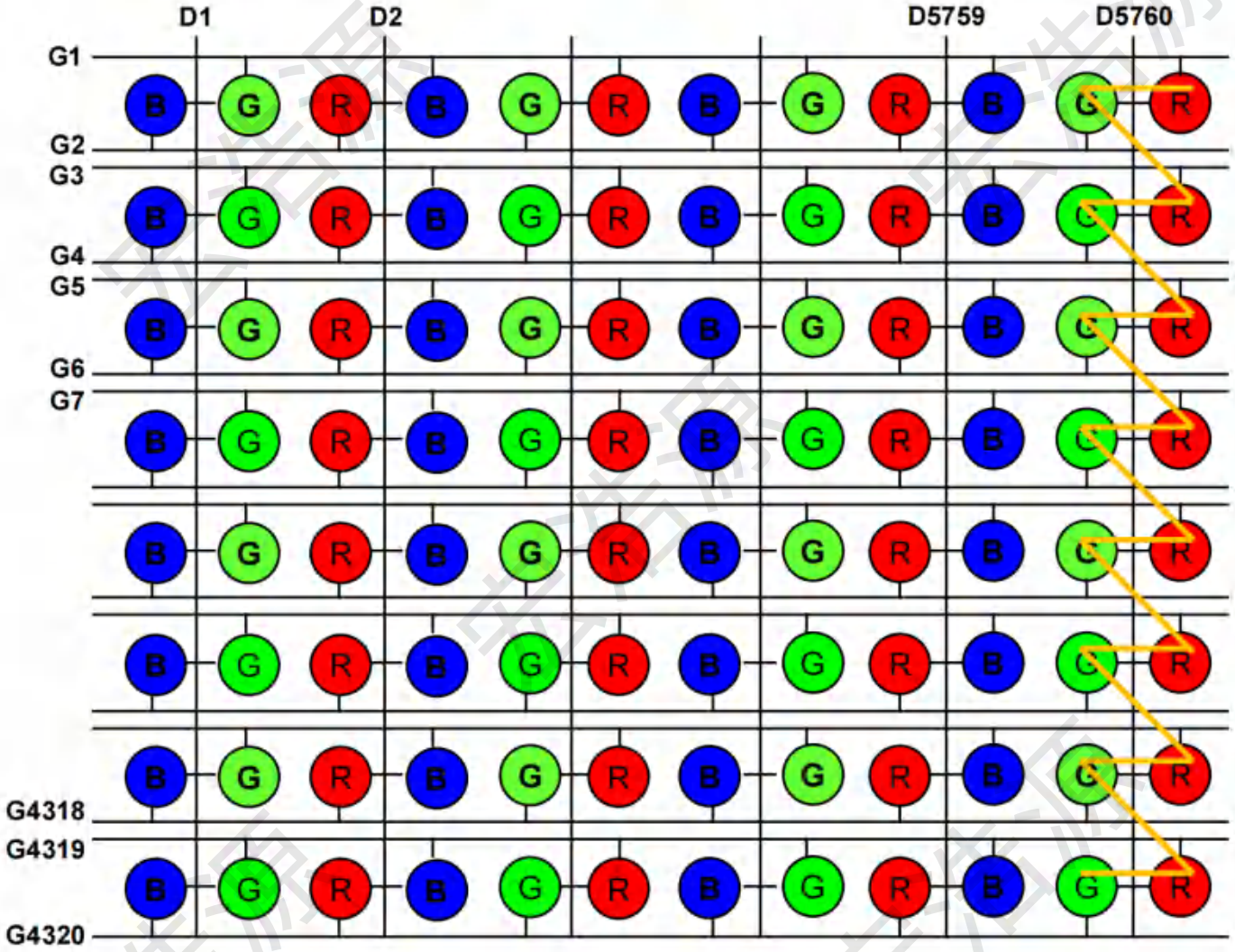


FIG. 5 Panel Pixel Structure

3-5. Power Sequence

3-5-1. LCD Driving circuit

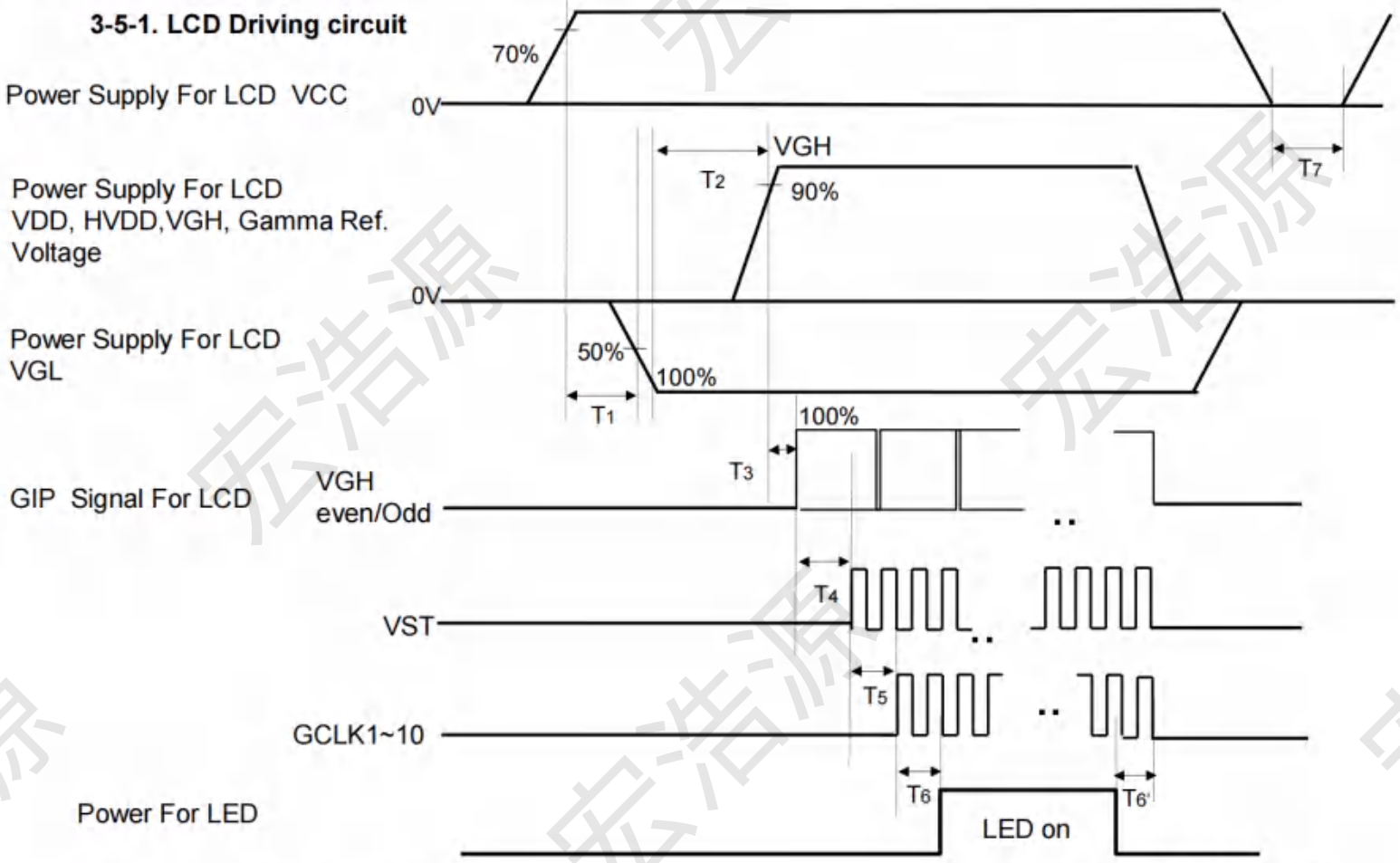


Table 5. POWER SEQUENCE

Ta= 25±2°C, fv=60Hz,

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	-	ms	
T2	0.5	-	-	ms	
T3	0	-	-	ms	
T4	10	-	-	ms	2
T5	0	-	-	ms	
T6 / T6'	20	-	-	ms	6
T7	2	-	-	s	

Note : 1. Power sequence for Source D-IC must follow the Case1 & 2.
※ Please refer to Appendix IV for more details.
2. VGH even & odd can not be "High at the same time.
3. Power Off Sequence order is reverse of Power On Condition including Source D-IC.
4. GCLK On/Off Sequence
: GCLK5 → GCLK4 →GCLK3 → GCLK2 → GCLK1 → CLK10 → GCLK9 → GCLK8 → GCLK7 → GCLK6 .
: GCLK should be turned Off before the EPI data signal Off
5. VDD_odd/even transition time should be within V_blank
6. In case of T6', If there is no abnormal display, no problem

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25±2°C. The values are specified at distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °. FIG. 1 shows additional information concerning the measurement equipment and method.

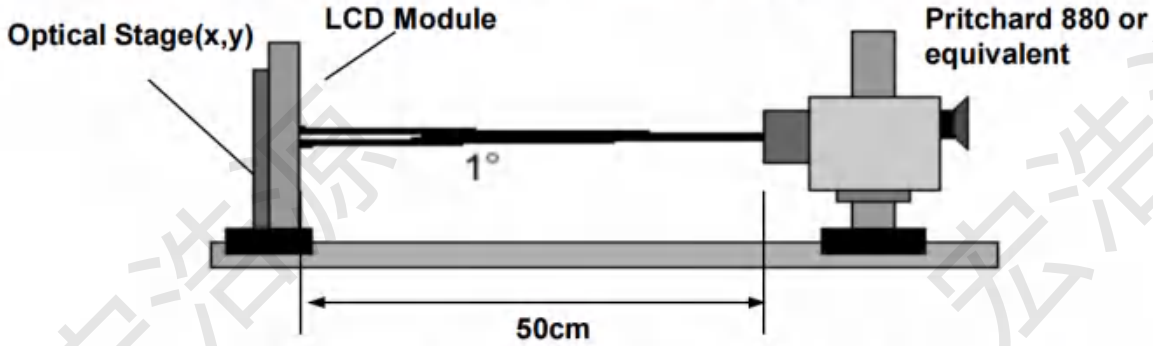


FIG. 6 Optical Characteristic Measurement Equipment and Method

Ta= 25±2°C VDD,H_VDD,VGH,VGL=typ, fv=60Hz,, BW=2.772GBPS , EXTV$_{BR-B}$ =100%
Light Source : D65 Standard

Table 6. OPTICAL CHARACTERISTICS

Parameter		Symbol	Value			Unit	notes
			Min	Typ	Max		
Contrast Ratio		CR	900	1300	-		1
Response Time	Rising	Tr	-	8	12	ms	2
	Falling	Tf	-	10	14		
Transmittance		T	4.95	5.51	-	%	3
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.661	Typ +0.03		4
		Ry		0.326			
	GREEN	Gx		0.279			
		Gy		0.590			
	BLUE	Bx		0.134			
		By		0.122			
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr (x axis)	89	-	-	degree	5
	x axis, left (ϕ=180°)	θl (x axis)	89	-	-		
	y axis, up (ϕ=90°)	θu (y axis)	89	-	-		
	y axis, down (ϕ=270°)	θd (y axis)	89	-	-		
Gray Scale			-	-	-		6

1. Contrast Ratio(CR) is defined mathematically as :
   CR(Contrast Ratio) = Maximum CRn (n=1, 2, 3, 4, 5)

$$CRn = \frac{\text{Surface Luminance at position n with all white pixels}}{\text{Surface Luminance at position n with all black pixels}}$$

   n = the Position number(1, 2, 3, 4, 5). For more information, see FIG 7.
   The value of CR should be extracted using the LGD sheet structure (Diffuser/Prism/Prism)

2. Response time is the time required for the display to transition from G(0) to G(1023) (Rise Time, Tr_R) and from G(0) to G(1023) (Decay Time, Tr_D). For additional information see the FIG. 8.

3. The value of Transmittance should be extracted using the LGD sheet structure (Diffuser/ Diffuser)

※. Surface luminance is determined after the unit has been 'ON' and 1Hour after lighting the backlight in a dark environment at 25±2°C. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 6.

4. The value of color coordinates should be extracted using the standard light source of D65

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG. 9.

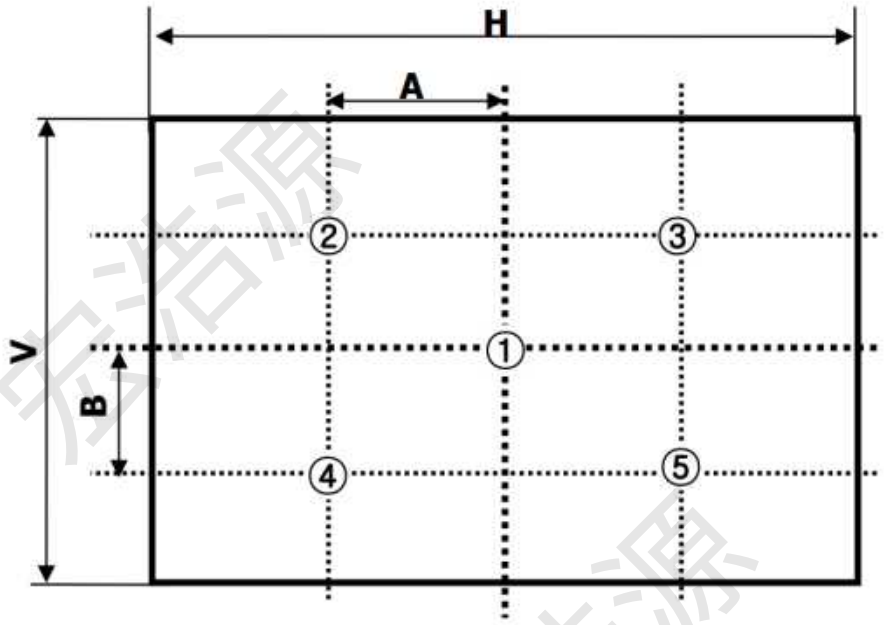
6. Gray scale specification
   Gamma Value is approximately 2.2. For more information, see the Table 7.

Table 7. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ)
L0	0.07
L63	0.27
L127	1.04
L191	2.49
L255	4.68
L319	7.66
L383	11.5
L447	16.1
L511	21.6
L575	28.1
L639	35.4
L703	43.7
L767	53.0
L831	63.2
L895	74.5
L959	86.7
L1023	100

	Gray Level	Gamma Ref.
Positive Voltage	L0	Gamma9
	L255	Gamma6
	L511	Gamma5
	L1023	Gamma1
Negative Voltage	L1023	Gamma18
	L511	Gamma14
	L255	Gamma13
	L0	Gamma10

Measuring point for Contrast Ratio



A : H / 4 mm
B : V / 4 mm
@ H,V : Active Area

FIG.7 Points for Contrast Ratio Measure

Response time is defined as the following figure and shall be measured by switching the input signal for "Black" ~ "White" and "White" ~ "Black".

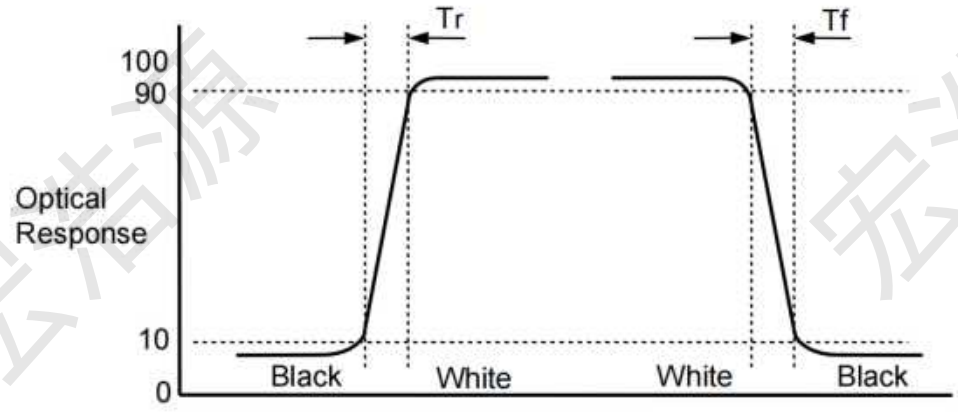


FIG.8 Response Time

Dimension of viewing angle range

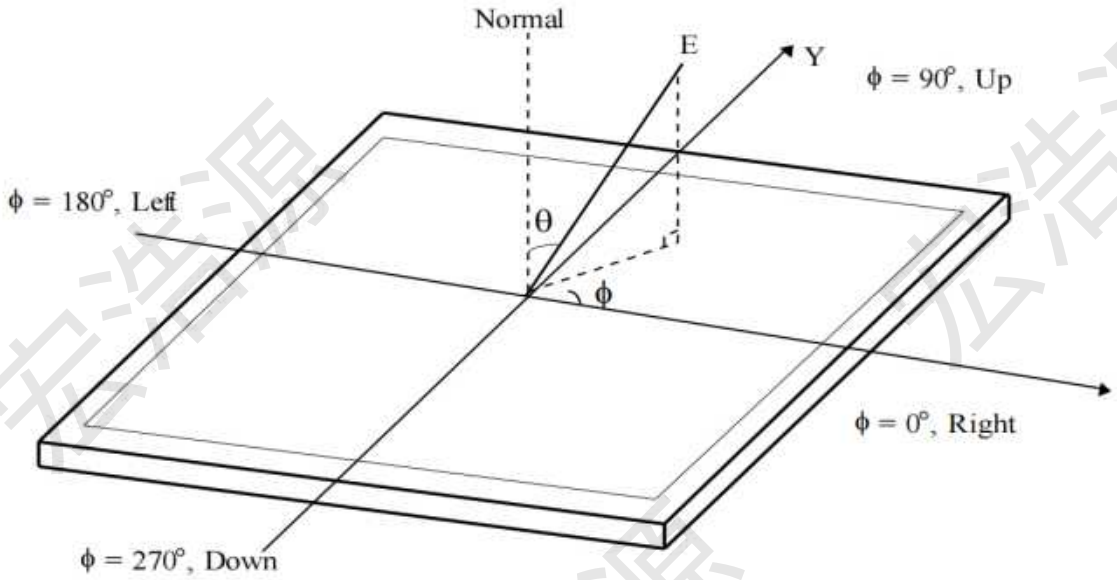


FIG.9 Viewing Angle

5. Mechanical Characteristics

Table 11 provides general mechanical characteristics.

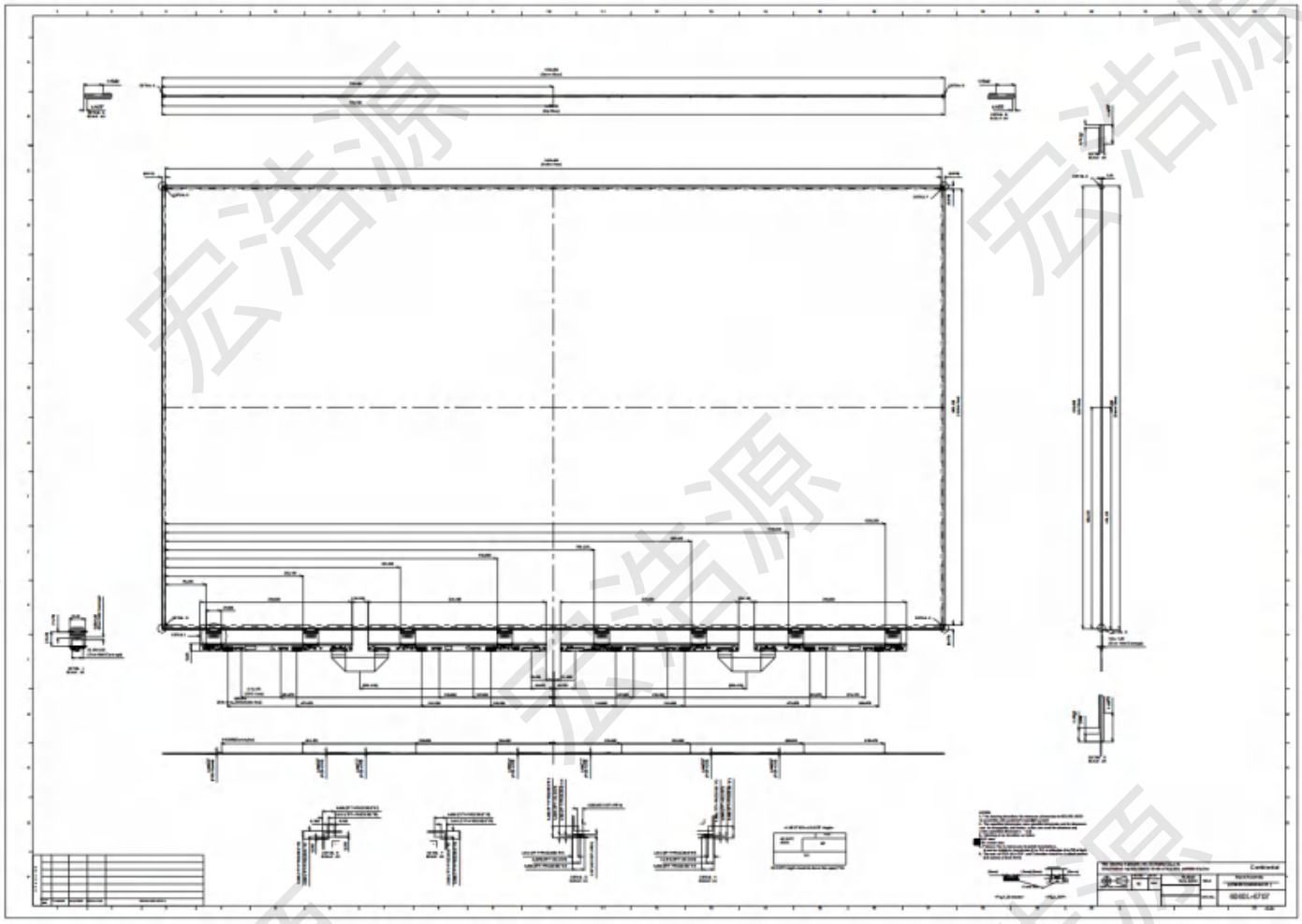
Table 11. MECHANICAL CHARACTERISTICS

Item	Value	
Outline Dimension (Only Glass)	Horizontal	1440.3mm
	Vertical	817.9mm
	Thickness	1.2 mm
Active Display Area	Horizontal	1428.48 mm
	Vertical	803.52 mm
Weight	3.2Kg(Typ.), 3.36Kg(Max.)	
Surface Treatment	Hard coating(2H), Anti-glare treatment of the front polarizer (Haze 3%(Typ.))	

Note : Please refer to a mechanical drawing in terms of tolerance at the next page.

6. Mechanical Dimension

6-1. Board Assembly Dimension



Date	Version

7. Reliability

Table 12. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C 90% 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 500h
4	Low temperature operation test	Ta= 0°C 500h
5	Humidity condition Operation	Ta= 40 °C ,90%RH
6	Altitude operating storage / shipment	0 - 16,400 ft 0 - 40,000 ft

Note : Before and after Reliability test, LCM should be operated with normal function.

8. International Standards

8-1. Safety

a) IEC 62368-1, The International Electro-technical Commission(IEC).
Audio/video, Information and Communication Technology Equipment - Safety - Safety Requirements.
b) EN 62368-1, European Committee for Electro-technical Standardization (CENELEC)
Audio/video, Information and Communication Technology Equipment - Safety Requirements
c) UL 62368-1, UL LLC.
Audio/video, Information and Communication Technology Equipment - Safety Requirements
d) CAN/CSA C22.2 No.62368-1, Canadian Standards Association (CSA).
Audio/video, Information and Communication Technology Equipment - Safety Requirements
e) IEC 60065, The International Electro-technical Commission (IEC).
Audio, Video and Similar Electronic Apparatus - Safety Requirements

8-2. Environment

a) RoHS, Directive **2011/65/EU** of the European Parliament and of the council of **8 June 2011**

9. Precautions

Please pay attention to the followings when you use this TFT LCD module.

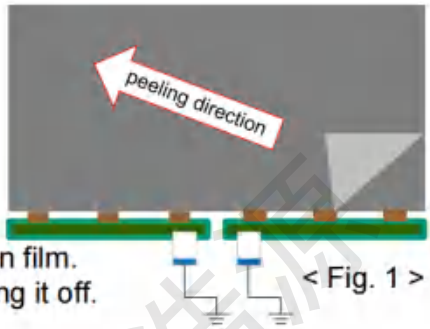
9-1. Handling Precautions

(1) Please attach the surface transparent protective film to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(2) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
(4) After removing the protective film, when the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine.
Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(5) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(6) Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.
Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly. Panel ground path should be connected to metal ground.
(7) Please make sure to avoid external forces applied to the Source PCB and D-IC during the process of handling or assembling the TV set. If not, It causes panel damage or malfunction.
(8) Panel and BLU should be protected from the static electricity. If not, it causes IC damage.
(9) Do not pull or fold the source D-IC which connect the source PCB and the panel.
(10) Panel(board ass'y) should be put on the BLU structure precisely to avoid mechanical impact.
(11) FFC Cable should be connected between System board and Source PCB correctly.
(12) Mechanical structure for backlight system should be designed for sustaining board ass'y safely.
(13) Surface temperature of the Component on PCB should be controlled under 100℃(D-IC :125℃) with TV Set status.
If not, problems such as IC damage or decrease of lifetime could occur.

9-2. Operating Precautions

(1) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(2) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, Stable time(required time that brightness is stable after turned on) becomes longer
(3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

9-3. Protection Film



< Fig. 1 >

(1) Please don't remove the protection film before assembly.
(2) Please peel off the protection film slowly.
(3) Please peel off the protection film just like shown in the Fig.1
(4) Ionized air should be blown over during the peeling.
(5) Source PCB should be connected to the ground when peel off the protection film.
(6) The protection film should not be contacted to the source D-IC during peeling it off.

9-4. B/A Box Pretreatment Precautions

In winter season , in particular, please be aware of the following precautions.
(1) Before putting B/A boxes on the line, aging process is required to make the temperature of products similar to the temperature of workplace.
(2) Place the lid open on the B/A box and allowed to stand for 24 hours in the similar environment of work place. It was shown in Fig.1


< Fig. 1 >

9-5. Storage Precautions

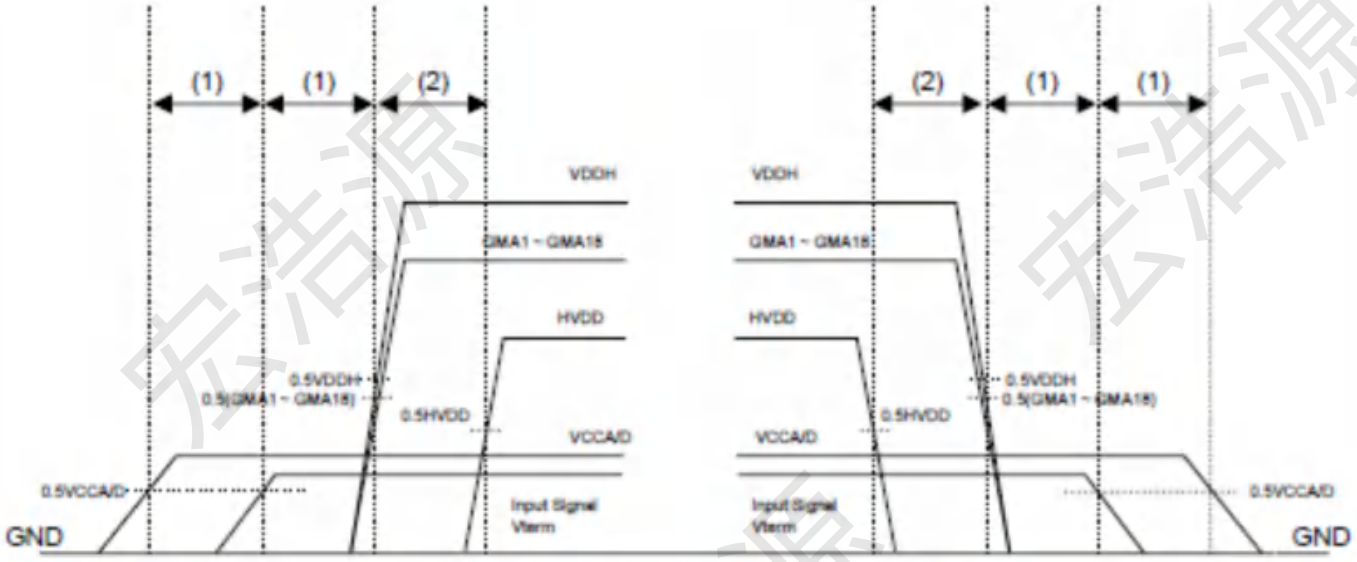
When storing modules as spares for a long time, the following precautions are necessary.

(1) Temperature : 5 ~ 40 ℃
(2) Humidity : 35 ~ 75 %RH
(3) Period : 6 months
(4) Control of ventilation and temperature is necessary.
(5) Please make sure to protect the product from strong light exposure, water or moisture. Be careful for condensation.
(6) Please keep the modules at a circumstance shown below Fig. 2

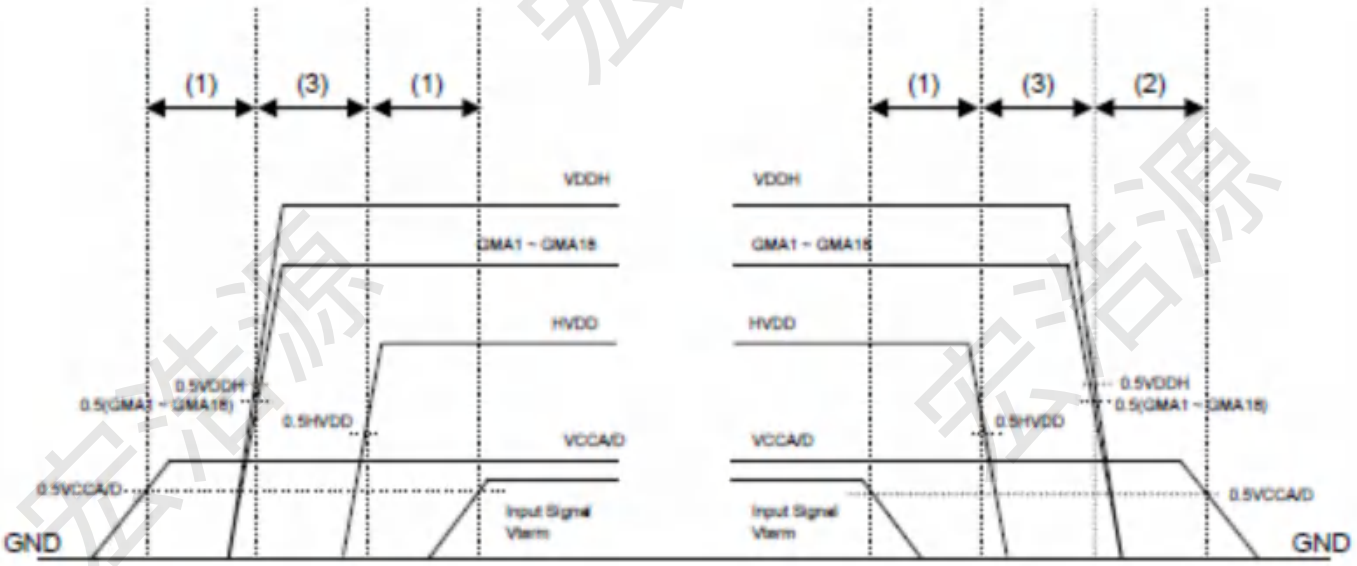
< Fig. 2 >

 # APPENDIX- III

■ Source D-IC Power Sequence



Note : (1)=0~1s, (2)=-200ms~1s (Always, VDD must be higher than or same width HVDD.)



Note : (1)=0~1s, (2)=-200ms~1s,
(3)=-200ms~1s (Always, VDD must be higher than or same width HVDD.)

- Input Signal : EPI

APPENDIX- IV-1

■ EPI control packet setting

1. Control Option Mapping

	Name	BIT	Description	Setting Value	Remark
CTR1	Dummy	C[1:0]		H	"H" fix
	CTR_Start	C2	CTR_Start	L	
		C3		L	
		C4		L	
		C5		L	
		C6		L	
		C7		L	
	POL	C8	Polarity signal	H/L	Changes every frame depends on inversion type
	GSP	C9	Gate start pulse bit	H/L	
	MODE	C10	Output reset function Mode	L	
	LTD1	C11	LTD Mode Selection 1	H	
	LTD2	C12	LTD Mode Selection 2	H	
	H2DOT	C13	Horizontal 2D inversion bit	L	
	INV_EN	C14	V4Dot INV Enable	H	
	INV1	C15		-	Refer to the Application Note
	INV2	C16		-	
	INV3	C17		-	
	INV4	C18		-	
	CSC	C19		L	
	PWRC1	C20	Power Control Mode 1	H	
	PWRC2	C21	Power Control Mode 2	H	
	SOE_FT1	C22		H/L	Different depends on D-IC No. Refer to the application note.
	SOE_FT2	C23		H/L	
	Reserved	C[25:24]		L	"L" fix
	Dummy	C[27:26]		L	"L" fix

※ LSB is transmitted at first, always.

APPENDIX- IV-2

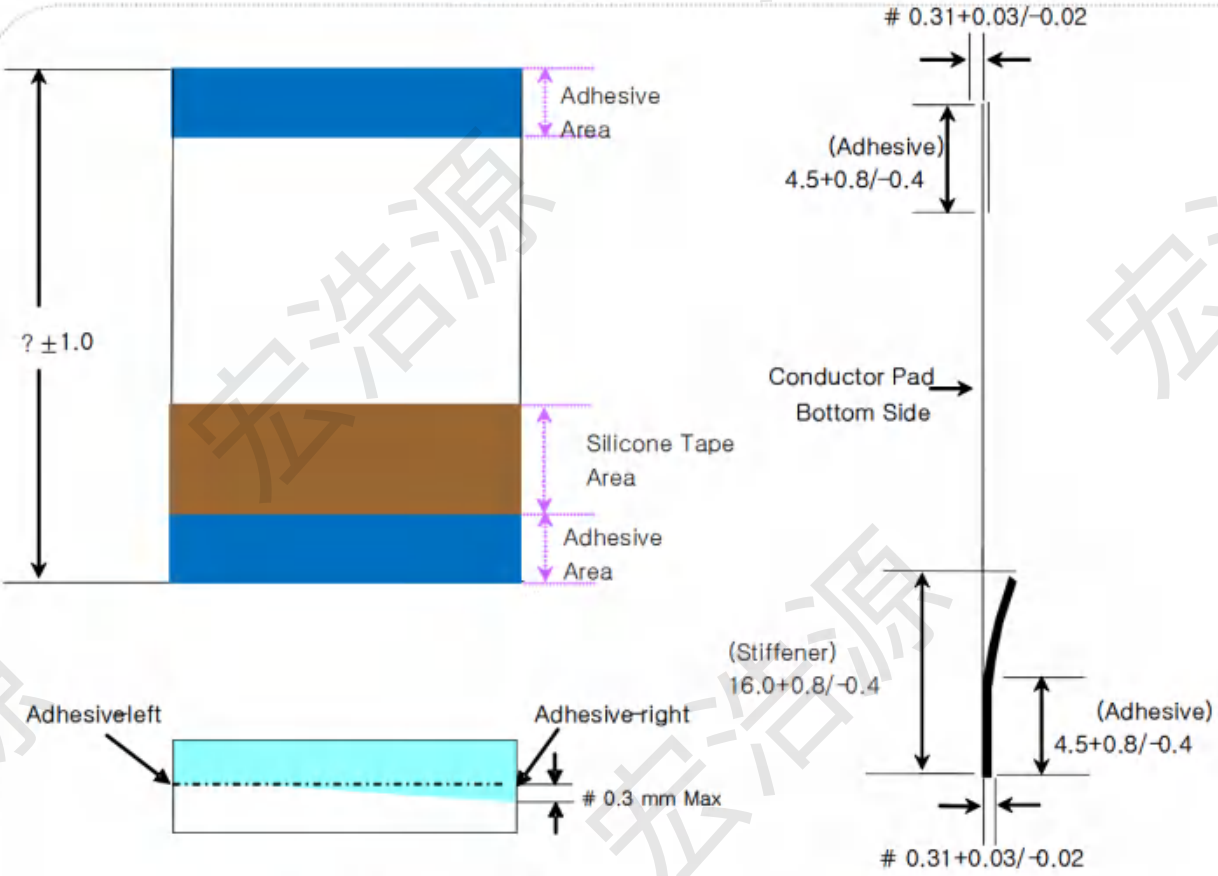
■ D-IC EPI Equalizer setting information

1-1. EPI EQ option

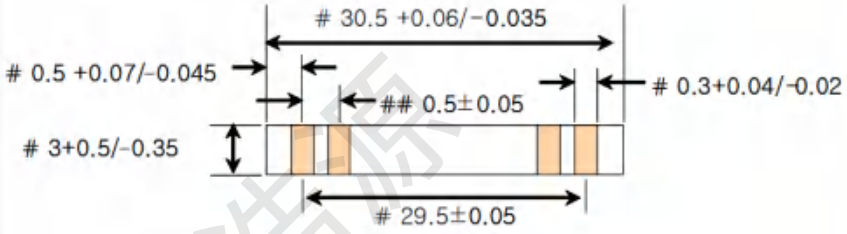
EQ	D-IC		EQ1	EQ2	Setting
Option	#1	EPI1	H	L	6dB
	#2	EPI2	H	L	6dB
	#3	EPI3	L	H	3dB
	#4	EPI4	L	H	3dB
	#5	EPI5	L	H	3dB
	#6	EPI6	L	H	3dB
	#7	EPI7	H	L	6dB
	#8	EPI8	H	L	6dB

APPENDIX-VIII-1

- LCD Connector : TF49-60S-0.5SH (manufactured by HIROSE)



< Pad Detail- 60Pin >



◆ Note

- Pad : GOLD Plating
- # ≥ Cpk 1.0
- ## ≥ Cpk 1.33
- Stiffener color : Sky Blue
- H-F
- Dimensions unit : mm

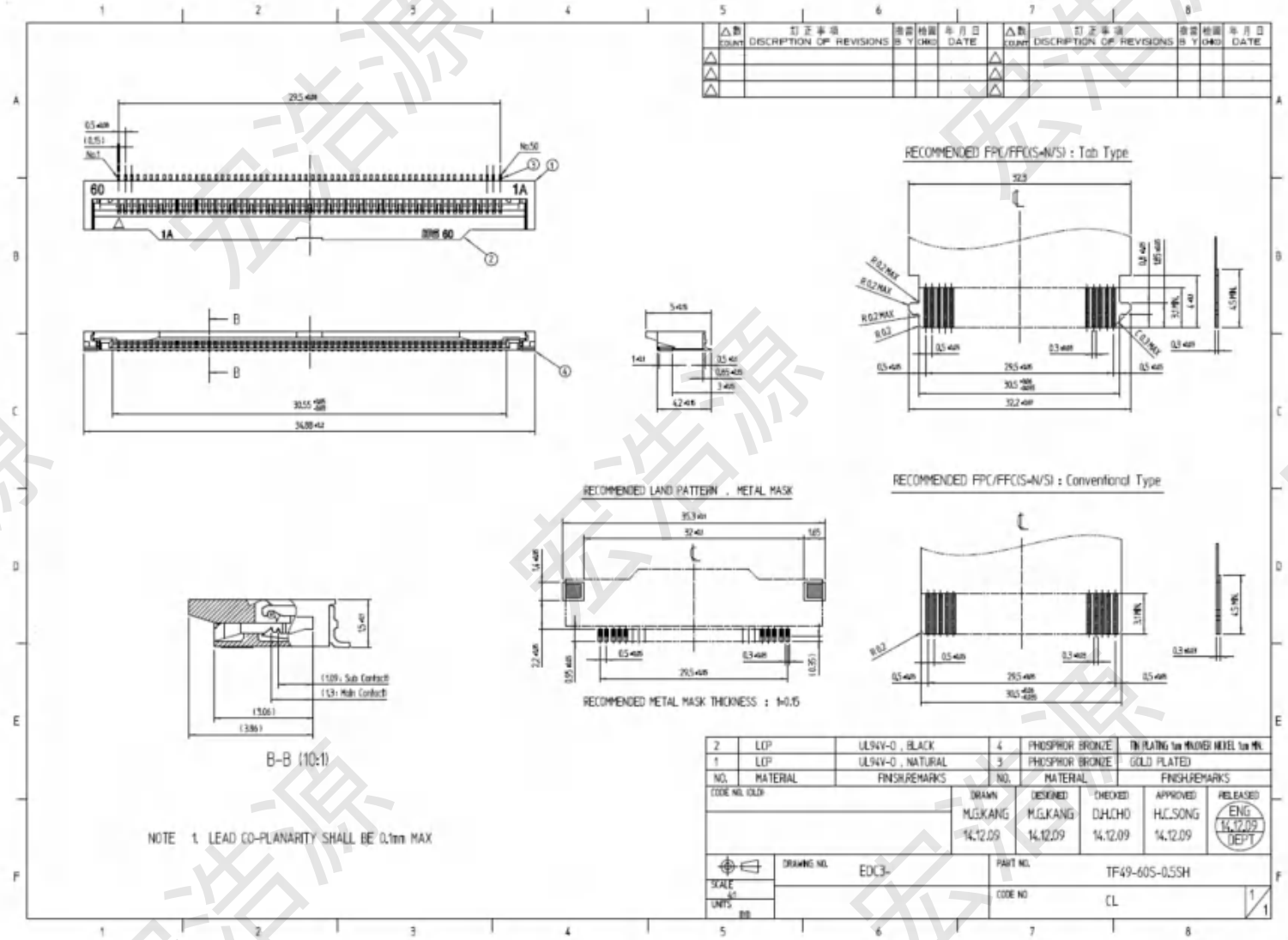
- Material List

APPLICATION	STANDARD	MATERIAL	REFERENCE
1. CONDUCTOR	GOLD PLATED COPPER WIRE	1. 99.99% COPPER 2. GOLD PLATED	1. Tolerance - THICKNESS ±0.01 - WIDTH +0.04 -0.02 2. ELOGATION(%) : 10 MORE THAN 3. TENSION : (KGF) 0.2 MORE THAN 4. GOLD THICKNESS : 0.05 μm MIN *MAKER : TAIHAN ELECTRIC plating process : 3 MICRON SUMITUN
2. INSULATION	POLYESTER FILM (PET/PET)	1. POLYESTER BASE FILM : 0.025 mm 2. POLYESTER HOTMELT ADHESIVE : 0.035 mm TOTAL THICKNESS : 0.060 mm	UL VW-1 FLAME Width : 120mm Length : 500M UNIT : ROLL * MAKER : SHINCHANG HOTMELT/ COSMOAMT
3. SUPPORTING TAPE	POLYESTER FILM	1. POLYESTER BASE FILM : 0.188 mm 2. POLYESTER HOTMELT ADHESIVE : 0.027 mm TOTAL THICKNESS : 0.215 mm	Width : 20.5mm Length : 250M Unit : ROLL *MAKER : SUNGSHIN Trading/ COSMOAMT
4. SILICON TAPE (BROWN)		TOTAL THICKNESS : 0.065 mm	*MAKER : DAEHYUN ST

APPENDIX-VIII-2

- LCD Connector : TF49-60S-0.5SH (manufactured by HIROSE)

- Drawing : TF49-60S-0.5SH (manufactured by HIROSE)



10.0 SURFACE LUMINANCE

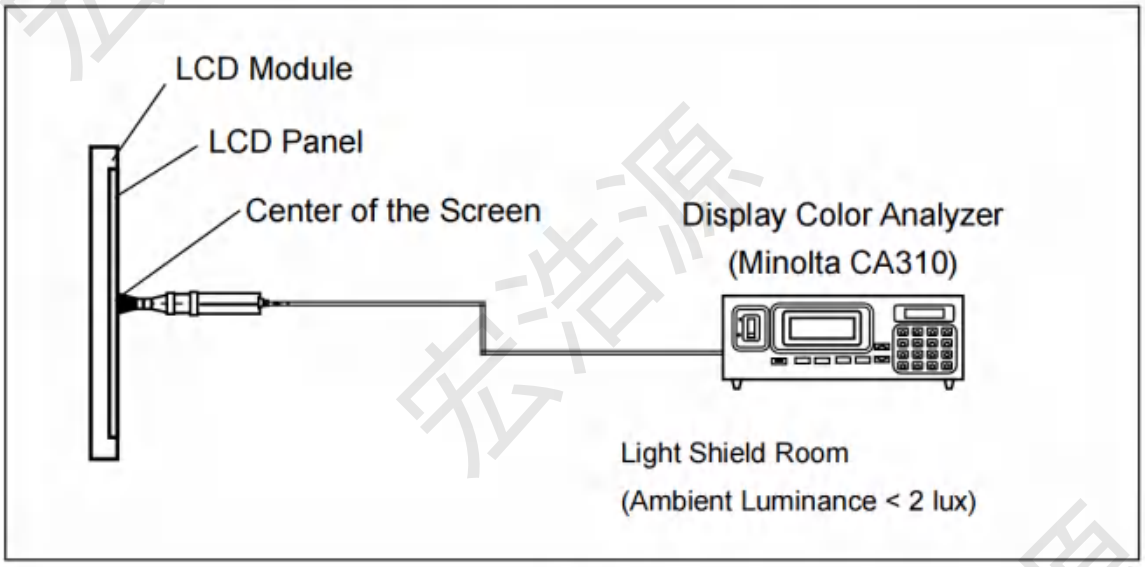
10.1 Definition of Luminance of White

Center Luminance of white is defined as luminance values of 5 point average across the LCD surface.

Luminance shall be measured with all pixels in the view field set first to white

Lv = corresponding to the luminance of the center point at the figure in Note (10)

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (10)

10.2 Center Luminance of White

Item	Symbol	Min	Typ	Max	Unit	Note
Center Luminance of White	Lv		300		cd/m^2	

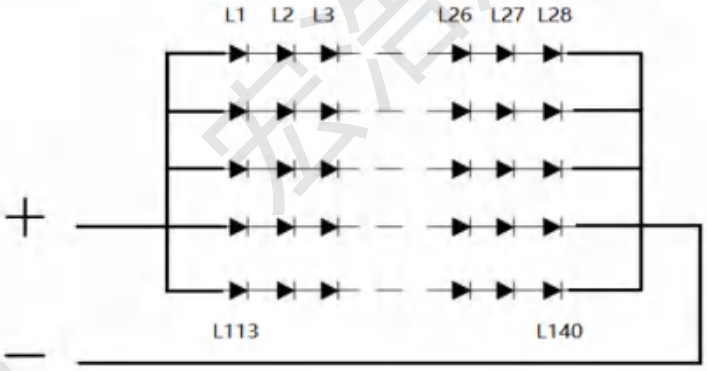
11.0 BACKLIGHT UNIT

11.1 LED LIGHTBAR UNIT CHARACTERISTICS

参数 Parameter			条件 Condition	最小 Min	典型 Typ	最大 Max	单位 Unit	备注 Remark
工作电流 Forward Current			Ta=25℃	-	1100	-	mA	Per L/B
工作电压 Operating Voltage				78.4	84	89.6	V	
工作功耗 Power Consumption				-	92.4	-	W	
色度 Chromaticity	A3	CIE-x	Ta=25℃ IF =90 mA (per LED)	0.2623	-	0.2751		LED
		CIE-y		0.2396	-	0.2528		
	A4	CIE-x		0.2664	-	0.2792		
		CIE-y		0.2480	-	0.2612		

（注：表格的工作功耗等于双灯条总功耗，1PCS产品使用2PCS灯条，工作总电流是550mA*2=1100mA）

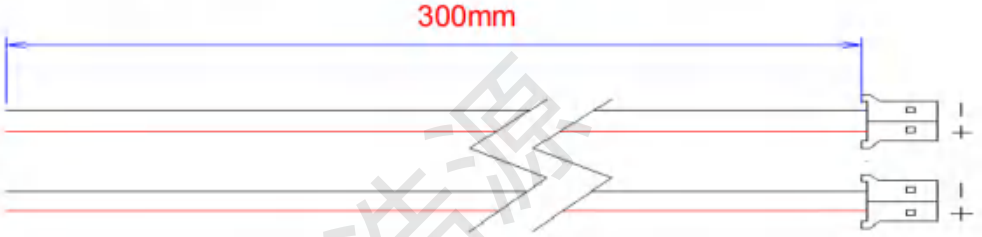
11.2 The Light bar Diagram



28串5并

（1PCS产品使用2PCS灯条，1PCS灯条使用140PCS灯珠，28串5并）

The pin configuration for the housing and leader wire is shown in the table below.Light bar connector type: PH2.0 - 2 PIN * 2PCS



12.0 DEFINITION OF LABELS

12.1 LCD MODULE LABEL

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

Model : 产品型号

Bar code : 条码

Serial number : 序列号

Light bar parameter : 灯条参数

Origin : 原产地

13.0 PACKING

13.1 PACKING FORM

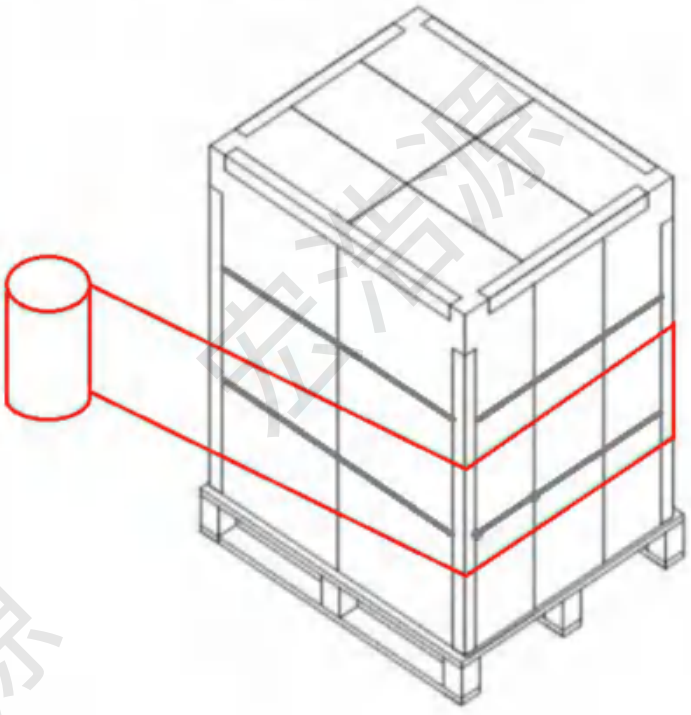
A Package quantity in one Carton : 4pcs

（包装数量：1个纸箱装4PCS）

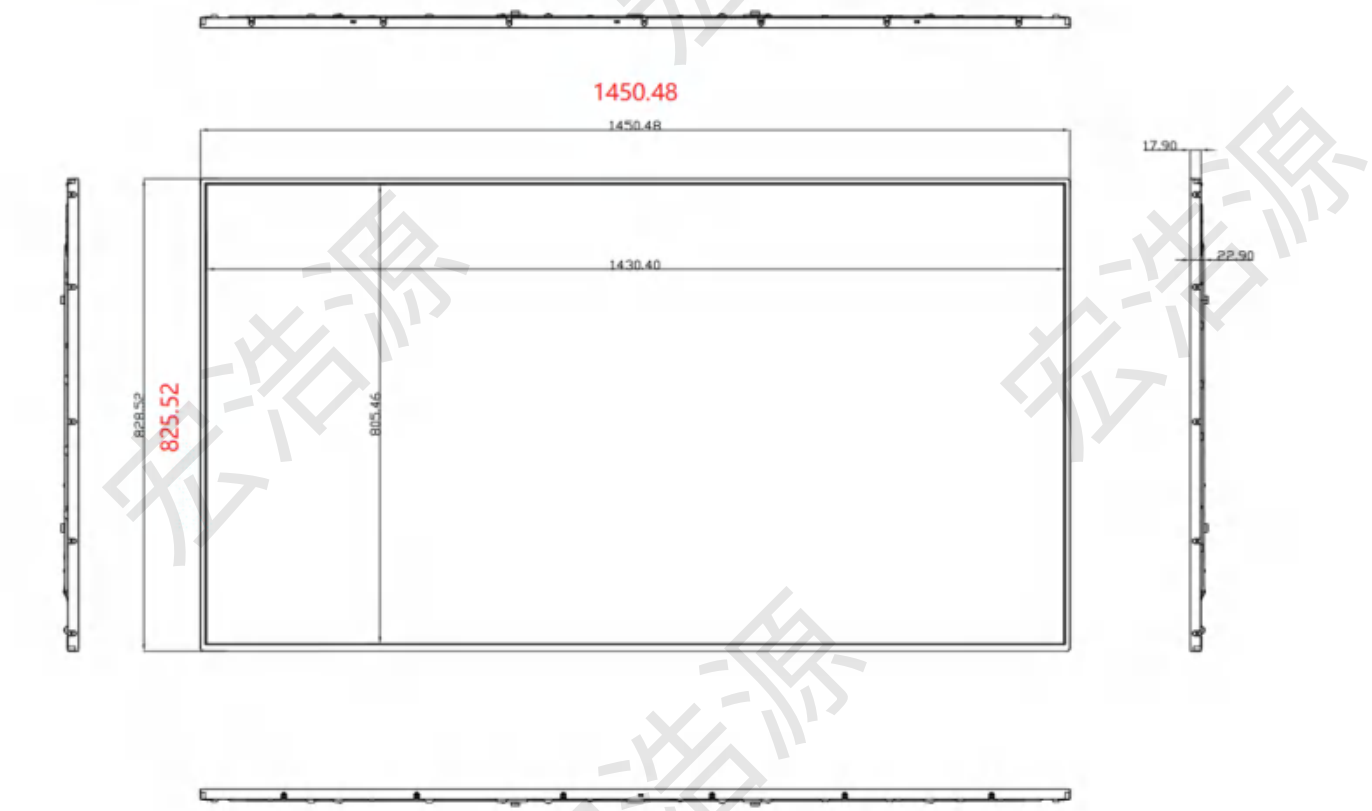
A Package quantity in one Pallet : 16pcs

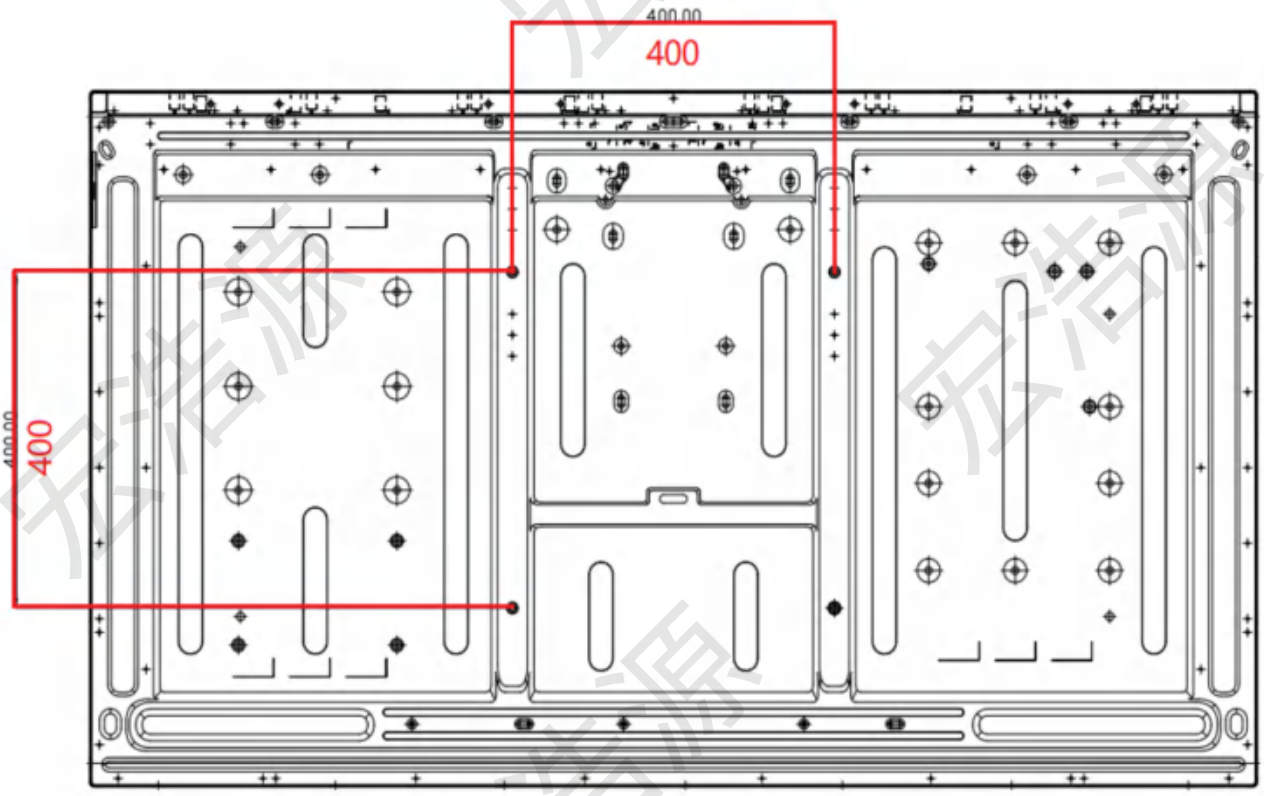
（包装数量：1个托板装16PCS）

The size of the pallet is different, so the amount of packaging for a pallet is different



14.0 MECHANICAL DRAWING





15.0 IMPRESSION DRAWING