☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

MODEL NO.: S270DR1
SUFFIX: A01

Revision :H1
Customer :

APPROVED BY SIGNATURE

Name / Title _____ _____
Note

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

Approved By	Checked By	Prepared By
Chris Chen	John Hsieh	CS Tsai

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REVISION HISTORY

Version	Date	Page(New)	Section	Description
Ver. 0.0	Oct.24,2024	All	All	Tentative Specification was first issued.
Ver. 1.0	Jun.23,2025	All	All	Preliminary Specification was first issued.
Ver.1.1	Jul.08.2025	5	1.2	High color saturation DCI-P3 95%/NTSC 85%
		28	5.2	Update "Color Chromaticity"
Ver.1.2	Jul.14,2025	5	1.2	Viewing Angle : 178(H)/178(V) (CR ≥ 10) AAS Technology
Ver.1.3	Aug.14.2025	8	2.3.2	Light bar voltage max. 76.3->77.1(VRMS)
		28	5.2	Correlated color temperature 7000->6500
Ver.2.0	Nov.24,2025	All	All	Approval Specification was first issued.
		27	4.7	Update Color Chromaticity
		30	5.2	Update Power on/off sequence
		35	6.4	Update drawing
		40~42	9	Update drawing

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

S270DR1-A01 is a 27" TFT Liquid Crystal Display PID module with LED Backlight unit and 51-pins-4 lane-eDP interface. This module supports 3840 x 2160 Full HDTV format and can display 1.07B colors (8-bit+FRC). The converter module for backlight is built-in.

1.2 FEATURES

- High brightness 700 nits
- High contrast ratio 1000:1
- Fast response time Gray to gray average 14 ms
- High color saturation DCI-P3 95%/NTSC 85%
- Half HDTV (3840 x 2160 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- eDP interface
- Optimized response time for 50Hz/60Hz frame rate
- Ultra wide viewing angle : AAS technology
- Viewing Angle : 178(H)/178(V) (CR ≥ 10) AAS Technology
- RoHS compliance
- T-con input frame rate: 50Hz/60Hz, output frame rate: 50Hz/60Hz

1.3 GENERAL SPECIFICATIONS

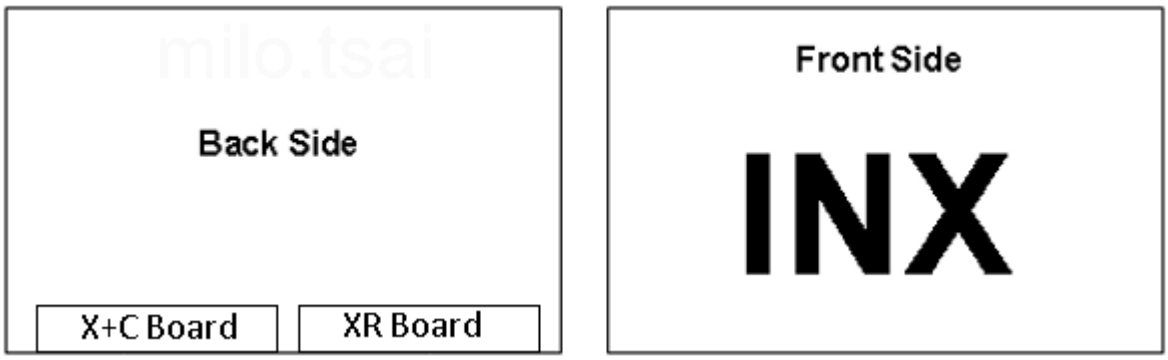
Item	Specification	Unit	Note
Active Area	596.736 (H) x 335.664 (V) (27" diagonal)	mm	(1)
Bezel Opening Area	601.9 (H) x 340.3 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	3840 x R.G.B. x 2160	pixel	-
Pixel Pitch	0.1554 (H) x 0.1554 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	1.07B(8bit+FRC)	color	-
Display Operation Mode	Transmissive mode / Normally black	-	-
Surface Treatment	Anti-Glare coating(Haze 25%) , Hardness 3H	-	(2)
Rotation Function	Unachievable		(3)
Display Orientation	Signal input with "INX"		(3)

Note (1) Please refer to the attached drawings in chapter 9 for more information about the front and back outlines.

Note (2) The spec. of the surface treatment is temporarily for this phase. INX reserves the rights to change this feature.

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Note (3)



1.4 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	615.7	616.7	617.7	mm	(1)
	Vertical (V)	359.3	360.3	361.3	mm	(1)
	Depth (D)	14.06	15.06	16.06	mm	(2)
	Depth (D)	21.4	22.4	23.4	mm	(3)
Weight		2200	2320	2440	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 Converter cover

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2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1),(2)
Operating Ambient Temperature	T_{OP}	-20	+60	ºC	(1),(2)
Panel Surface Temperature	T_{PS}	-	+70	ºC	(3),(4)

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

(a) 90 %RH Max. (Ta ≦ 40 ºC).

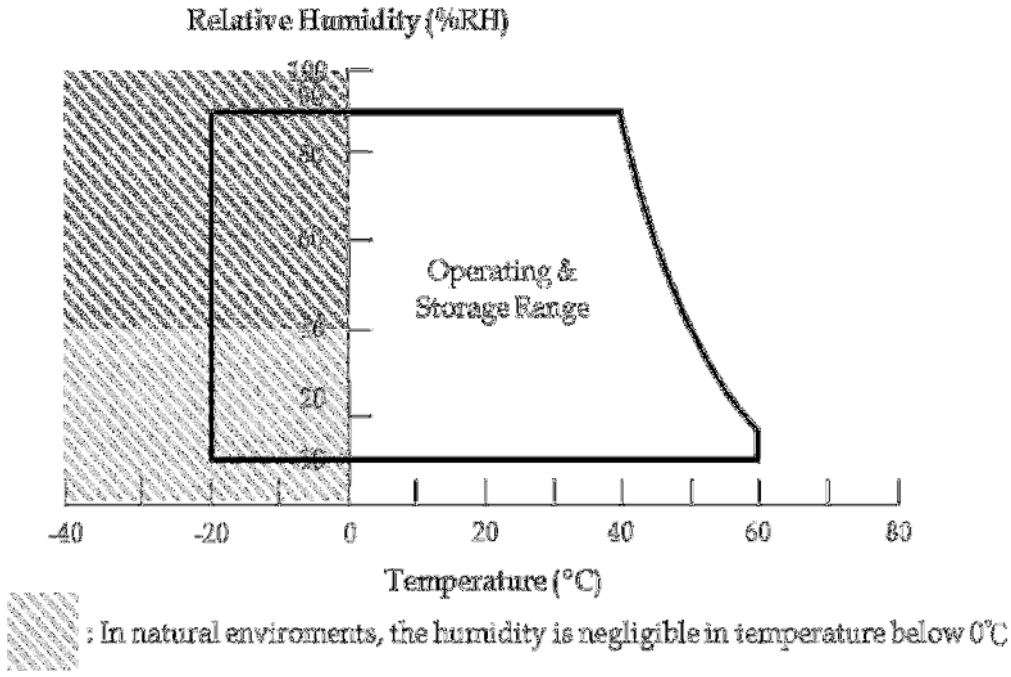
(b) Wet-bulb temperature should be 39 ºC Max.

(c) No condensation.

Note (2) The specified temperature range is determined by the design of the product set. When integrated with the customer's system, it is imperative to control environmental conditions within this prescribed range; otherwise, the operational capability of the product cannot be guaranteed.

Note (3) Surface temperature is measured at 60 ºC dry condition.

Note (4) Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 70ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.



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2.2 PACKAGE STORAGE

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

ITEM	UNIT	MIN	TYP	MAX
Storage Temperature	℃	0	25	35
Storage Humidity	%RH	35	50	75
Storage Life	18 months			
Storage Condition	(1) The storage room should be equipped in indoor and good ventilation facility. (2) Prevent products from being exposed to the direct sunlight, moisture and water. (3) The product need to keep away from organic solvent and corrosive gas. (4) Be careful for condensation at sudden temperature change. (5) Storage life is guaranteed under packing conditions: (a) The product should be placed in a sealed moisture-proof. (b) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.			

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	

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

2.3.2 BACKLIGHT CONVERTER UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Light Bar Voltage	VW	—	77.1	VRMS	
Converter Input Voltage	VBL	21.6	26.4	V	(1)
Control Signal Level	—	-0.3	6	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 include On/Off Control and External PWM Control.

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3. BACKLIGHT CONVERTER UNIT

3.1 CONVERTER CHARACTERISTICS

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	P_{BL}	-	44	52	W	(1), (2)
Converter Input Voltage	VBL	22.8	24.0	25.2	VDC	
Converter Input Current	I_{BL}	-	1.8	2.2	A	Non Dimming
Input Inrush Current	I_R	-	-	11.6	Apeak	V_{BL}=22.8V, (3)
Dimming Frequency	FB	150	-	170	Hz	
Dimming Duty Ratio	DDR	5	-	100	%	(4)
Life Time	-	50,000	-	-	Hrs	(5)

Note (1) The power supply capacity should be higher than the total converter power consumption PBL. 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 converter dimming.

Note (2) The measurement condition of Max. value is based on 27" backlight unit under input voltage 24V.

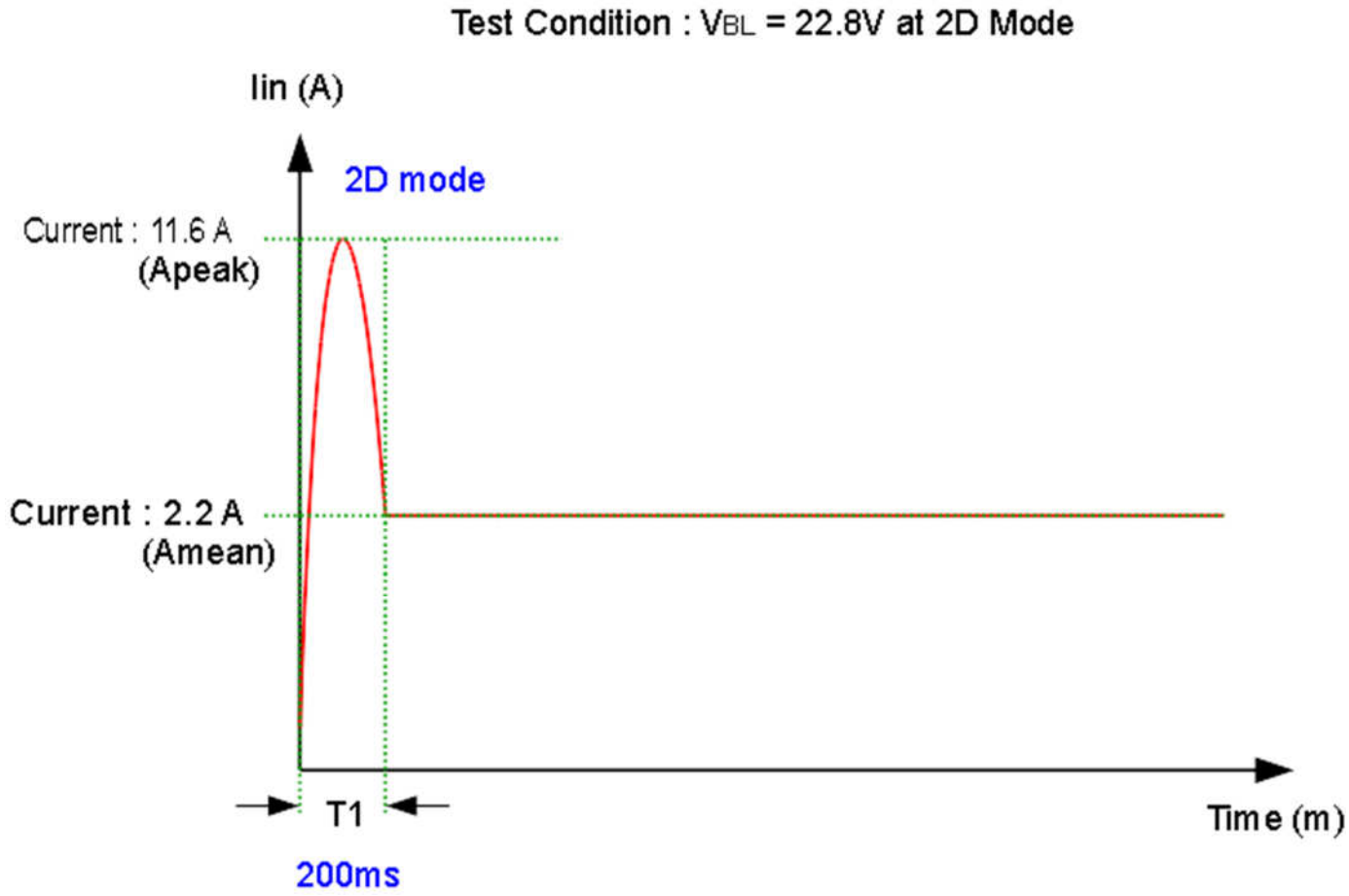
Note (3) For input inrush current measure, the VBL rising time from 10% to 90% is about 20ms.

Note (4) EPWM signal have to input available duty range. 5% minimum duty ratio is only valid for electrical operation.

Note (5) 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℃

Note (6) Below diagram is only for power supply design reference.

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3.2 CONVERTER INTERFACE CHARACTERISTICS

Parameter		Symbol	Test Condition	Value			Unit	Note	
				Min.	Typ.	Max.			
On/Off Control Voltage	ON	VBLON	—	2.0	—	5.0	V		
	OFF		—	0	—	0.8	V		
External PWM Control Voltage	HI	VEPWM	—	2.0	—	5.0	V	Duty on	(5)
	LO		—	0	—	0.8	V	Duty off	
Error Signal		ERR	—	—	—	—	—	Abnormal: Open	
VBL Rising Time		Tr1	—	20	—	—	ms	10%-90%V_{BL}	
Control Signal Rising Time		Tr	—	—	—	100	ms		
Control Signal Falling Time		Tf	—	—	—	100	ms		
PWM Signal Rising Time		TPWMR	—	—	—	50	us		
PWM Signal Falling Time		TPWMF	—	—	—	50	us		
Input Impedance		Rin	—	1	—	—	MΩ		
PWM Delay Time		TPWM	—	100	—	—	ms		
BLON Delay Time		T_{on}	—	300	—	—	ms		
		T_{on1}	—	300	—	—	ms		
BLON Off Time		Toff	—	300	—	—	ms		

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

Note (2) The power sequence and control signal timing are shown in the Fig.1. For a certain reason, the converter 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

Note (4) When converter protective function is triggered, ERR will output open collector status. (Fig.2)

Note (5) The EPWM interface that inserts a pull up resistor to 5V in Max Duty (100%), please refers to Fig.3.

Note (6) EPWM signal have to input available frequency range.

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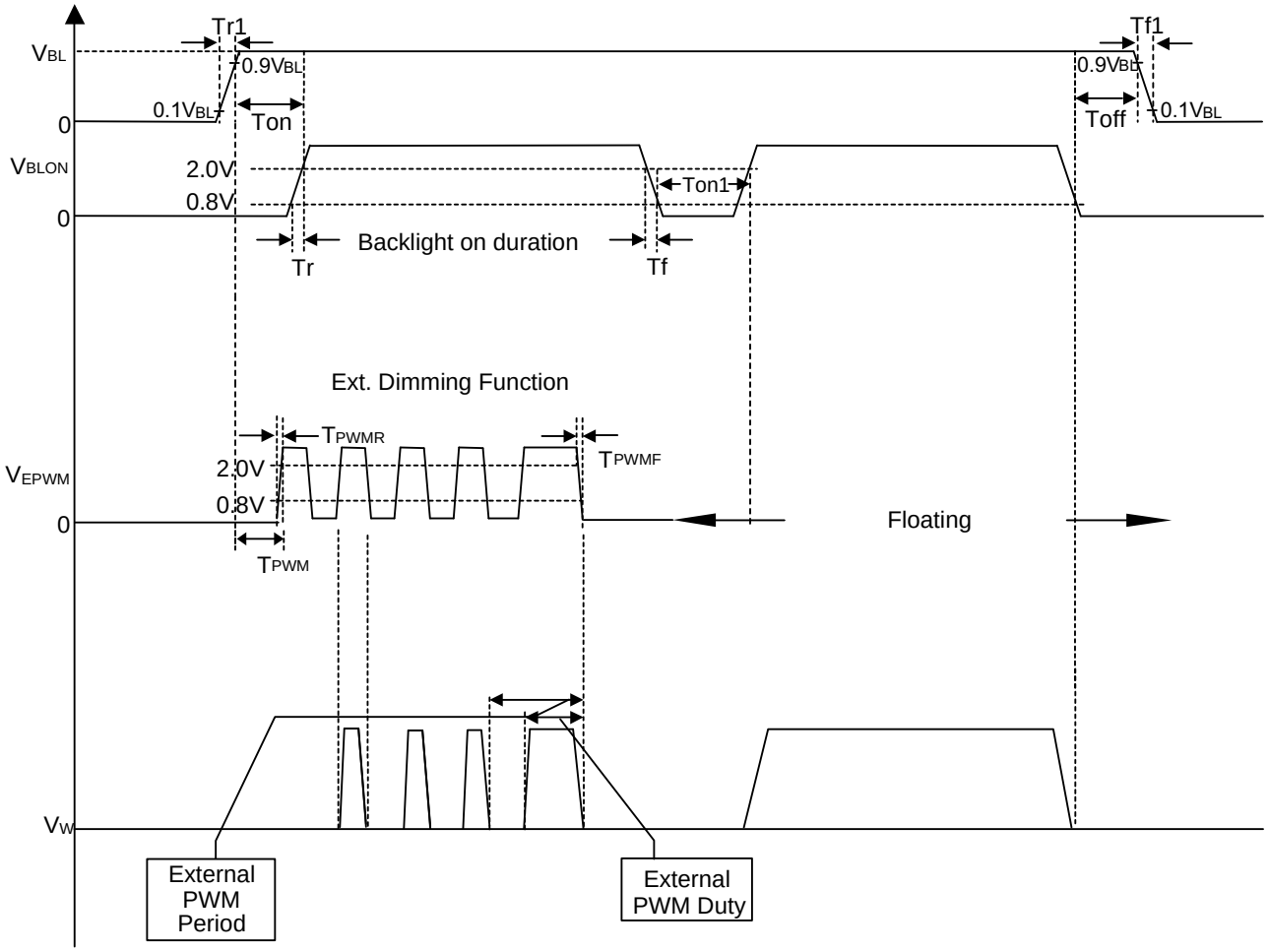


Fig. 1

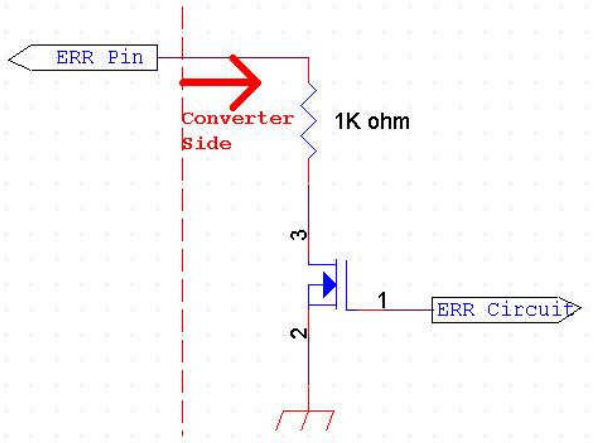


Fig. 2

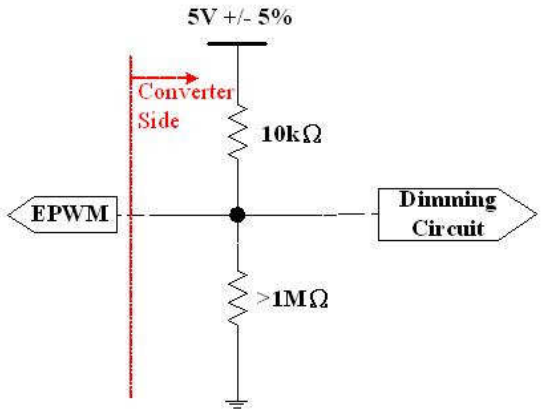


Fig. 3

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3.3 BACKLIGHT UNIT

3.3.1 LIGHT BAR UNIT

[1] Connector (wire type)

Item	Description
Type part number	Cvilux CI1406M1VL0-N-NH ACES 50429-0060N-001

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

CNL01 Connector Pin Assignment:

CNL01

Pin №	Symbol	Feature
1	VLED+	Positive of LED String
2	VLED+	
3	N1	Negative of LED String
4	N2	
5	N3	
6	N4	

3.3.2 CONVERTER UNIT

Connector (wire type)

Item	Description
Type part number	Cvilux CI0114M1HR0-LA FCN JH2-D4-143N
Mating housing part number	Cvilux_CI0114S0000 or compatible

CNV04 Connector Pin Assignment:

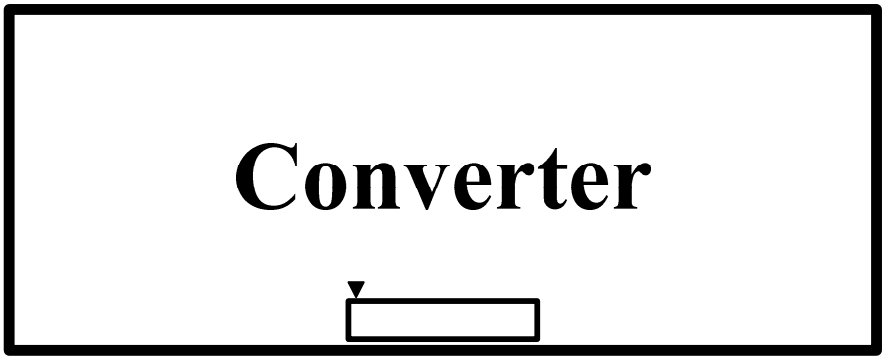
Pin No.	Symbol	Feature
1	VBL	+24V
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		

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11	ERR	Normal (GND) ; Abnormal (Open collector)
12	BLON	BL ON/OFF
13	NC	NC
14	E_PWM	External PWM Control

Note (1) If Pin14 is open, E_PWM is 100% duty.

Note (2) Input connector pin order defined as follows

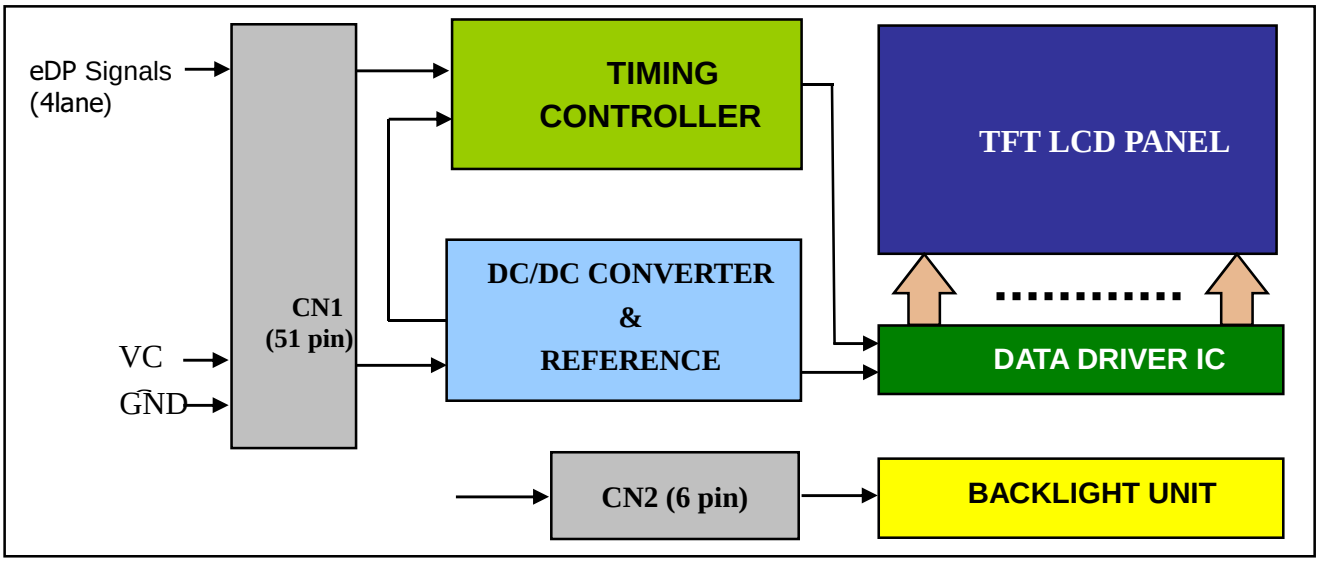


Input Connector

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4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



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4.2 INTERFACE CONNECTIONS

PIN ASSIGNMENT(CN1：eDP 51pins)

Pin	Name	Description	Note
1	Vin	Power input (+12V)	
2	Vin	Power input (+12V)	
3	Vin	Power input (+12V)	
4	Vin	Power input (+12V)	
5	Vin	Power input (+12V)	
6	Vin	Power input (+12V)	
7	N.C.	No Connection	(1)
8	N.C.	No Connection	(1)
9	N.C.	No Connection	(1)
10	N.C.	No Connection	(1)
11	N.C.	No Connection	(1)
12	GND.	Ground	
13	N.C.	No Connection	(1)
14	N.C.	No Connection	(1)
15	N.C.	No Connection	(1)
16	GND.	Ground	
17	GND.	Ground	
18	RX0P	True Signal for Main Link 0	(4)
19	RX0N	Component Signal for Main Link 0	(4)
20	GND.	Ground	
21	RX1P	True Signal for Main Link 1	(4)
22	RX1N	Component Signal for Main Link 1	(4)
23	GND.	Ground	
24	RX2P	True Signal for Main Link 2	(4)
25	RX2N	Component Signal for Main Link 2	(4)
26	GND.	Ground	
27	RX3P	True Signal for Main Link 3	(4)
28	RX3N	Component Signal for Main Link 3	(4)
29	GND.	Ground	
30	AUXN	Component Signal for Auxiliary Channel	
31	AUXP	True Signal for Auxiliary Channel	
32	GND.	Ground	
33	HPD	Hot Plug Detect Signal	
34	GND.	Ground	
35	N.C.	No Connection	(1)
36	GND.	Ground	
37	N.C.	No Connection	(1)
38	N.C.	No Connection	(1)

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39	GND.	Ground	
40	N.C.	No Connection	(1)
41	N.C.	No Connection	(1)
42	GND.	Ground	
43	N.C.	No Connection	(1)
44	N.C.	No Connection	(1)
45	GND.	Ground	
46	N.C.	No Connection	(1)
47	N.C.	No Connection	(1)
48	GND.	Ground	
49	N.C.	No Connection	(1)
50	N.C.	No Connection	(1)
51	GND.	Ground	

*Notice: There would be compatible issues if not using the indicated connectors in the matching list.

Connector Information

Note (1) Reserved for internal use. Please leave it open.

Note (2) Connector Part No.:

Item	Description
Type Part Number	P-Two 187059-51221
	FCN WF23-402-5133

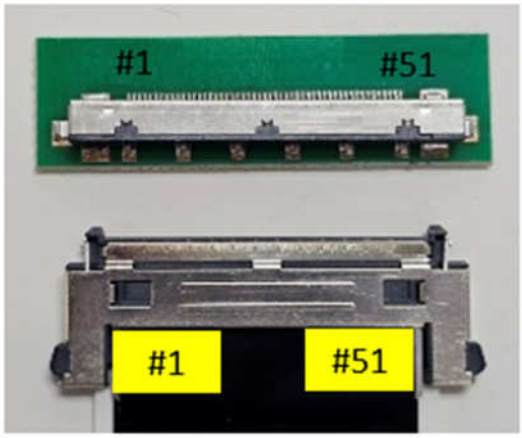
Note (3) User's connector Part No:

Item	Description
Mating Wire Cable Connector Part No	JAE FI-RE5HL
	P-Two LVDS 28 type_187120-51001-3
	Hamburg FCC-W50-510001-000C or compatible

Note (4) eDP 4 Lane Main Link.

Note (5) The direction of pin assignment is shown as below





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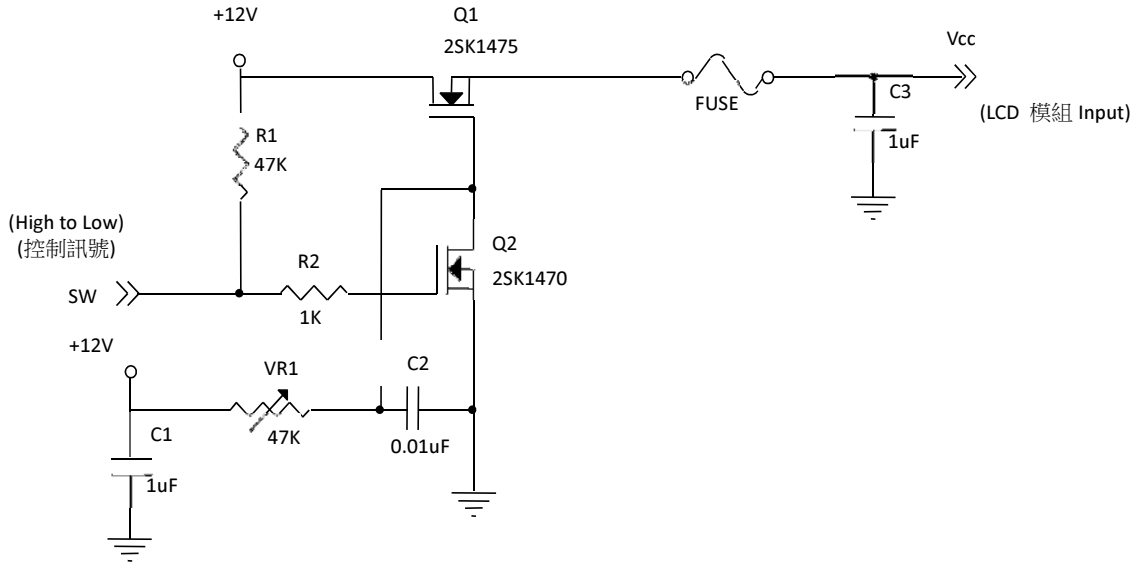
4.3 ELECTRICAL CHARACTERISTICS

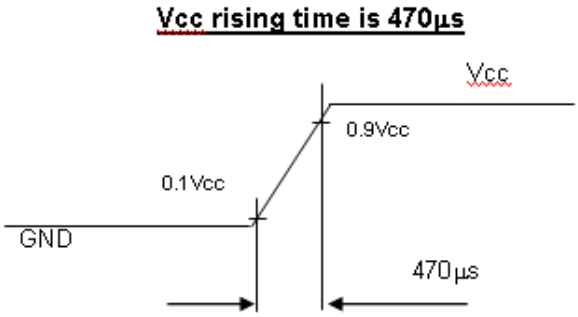
4.3.1 LCD ELETRONICS SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	10.8	12	13.2	V	-
Ripple Voltage		V_{RP}	-	-	500	mV	(5)
Rush Current		I_{RUSH}	-	-	5	A	(2)
Power Supply Current	White	Icc	-	0.46	0.5	A	(3)a
	Black		-	0.41	0.44	A	(3)b
	Max Power Pattern		-	0.9	0.98	A	(3)c
Power Consumption	Typ. FR	PLCD	-	10.8	11.76	Watt	(4)
	Max. FR		-	11.28	12.24	Watt	
CMOS interface	Input high Threshold Voltage	VIH	2.7	-	3.3	V	-
	Input Low Threshold Voltage	VIL	0	-	0.7	V	-

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) Measurement Conditions:





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Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 °C, Fr = 60Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern



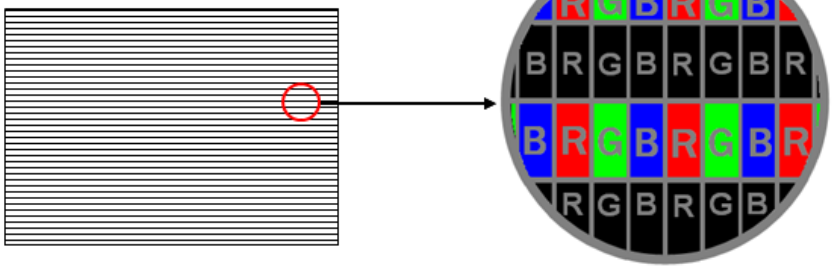
Active Area

b. Black Pattern



Active Area

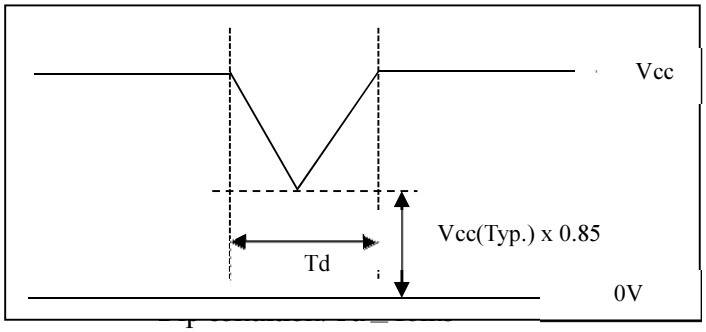
c. Horizontal Pattern



Note (4) The power consumption is specified at the pattern with the maximum current.

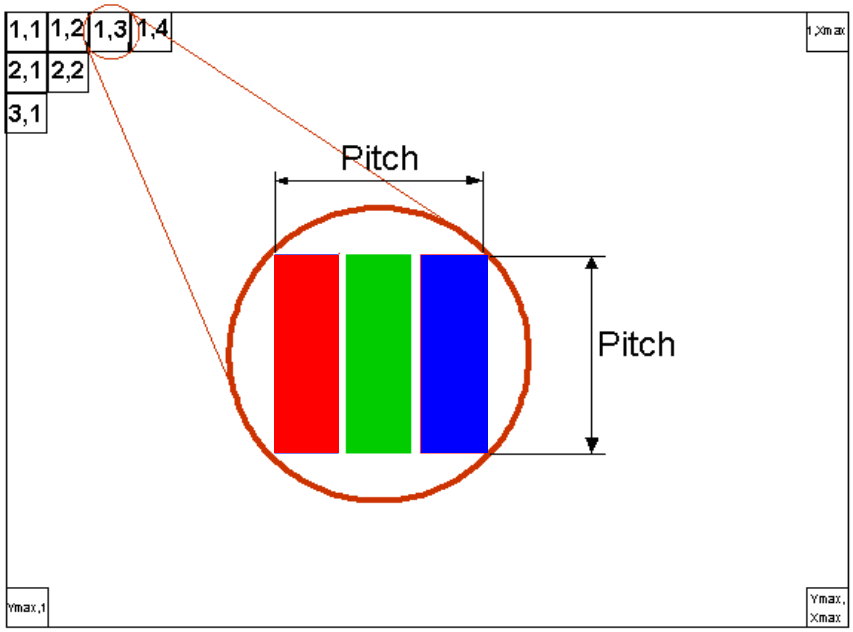
Note (5) Vcc =Typ. , Fr=Max. , Test pattern: White pattern

4.3.2 VCC POWER DIP CONDITION



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4.4 eDP INPUT DATA MAPPING TABLE



4 Lane eDP

Lane	Data Stream
Lane 0	1, 5, 9, ..., 3833, 3837
Lane 1	2, 6, 10, ..., 3834, 3838
Lane 2	3, 7, 11, ..., 3835, 3839
Lane 3	4, 8, 12, ..., 3836, 3840

4 lane 10 bits input Data format

Lane 0	Lane 1	Lane 2	Lane 3
R1-9:2	R2-9:2	R3-9:2	R4-9:2
R1-1:0 | G1-9:4	R2-1:0 | G2-9:4	R3-1:0 | G3-9:4	R4-1:0 | G4-9:4
G1-3:0 | B1-9:6	G2-3:0 | B2-9:6	G3-3:0 | B3-9:6	G4-3:0 | B4-9:6
B1-5:0 | R5-9:8	B2-5:0 | R6-9:8	B3-5:0 | R7-9:8	B4-5:0 | R8-9:8
R5-7:0	R6-7:0	R7-7:0	R8-7:0
G5-9:2	G6-9:2	G7-9:2	G8-9:2
G5-1:0 | B5-9:4	G6-1:0 | B6-9:4	G7-1:0 | B7-9:4	G8-1:0 | B8-9:4
B5-3:0 | R9-9:6	B6-3:0 | R10-9:6	B7-3:0 | R11-9:6	B8-3:0 | R12-9:6
R9-5:0 | G9-9:8	R10-5:0 | G10-9:8	R11-5:0 | G11-9:8	R12-5:0 | G12-9:8
G9-7:0	G10-7:0	G11-7:0	G12-7:0
B9-9:2	B10-9:2	B11-9:2	B12-9:2
B9-1:0 | R13-9:4	B10-1:0 | R14-9:4	B11-1:0 | R15-9:4	B12-1:0 | R16-9:4
R13-3:0 | G13-9:6	R14-3:0 | G14-9:6	R15-3:0 | G15-9:6	R16-3:0 | G16-9:6
G13-5:0 | B13-9:8	G14-5:0 | B14-9:8	G15-5:0 | B15-9:8	G16-5:0 | B16-9:8
B13-7:0	B14-7:0	B15-7:0	B16-7:0

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4.4.1 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	G7	G6	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	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	0	1	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	1	0	1
	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

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4.5 DISPLAY TIMING SPECIFICATIONS

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

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
eDP	Frequency	Fc	518.28	533.28	552	MHz	(3)
Vertical Display Term	Frame Rate	Fr	39	60	62	Hz	-
	Total	Tv	2219	2222	3545	Th	Tv=Tvd+Tvb
	Active Display	Tvd	2160	2160	2160	Th	-
	Blank	Tvb	59	62	1385	Th	-
Horizontal Display Term	Frequency	Fh	95	133	139	KHz	-
	Total	Th	3968	4000	5440	Tc	Th=Thd+Thb
	Active Display	Thd	3840	3840	3840	Tc	-
	Blank	Thb	128	160	1600	Tc	-

Note(1) In Free-sync mode, only guaranteed no functional failure, but don't guaranteed its quality of the optical and cosmetic performance.

Note(2) The optimal Vertical Frame Rate is 59~62Hz for best picture quality

Note(3) Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

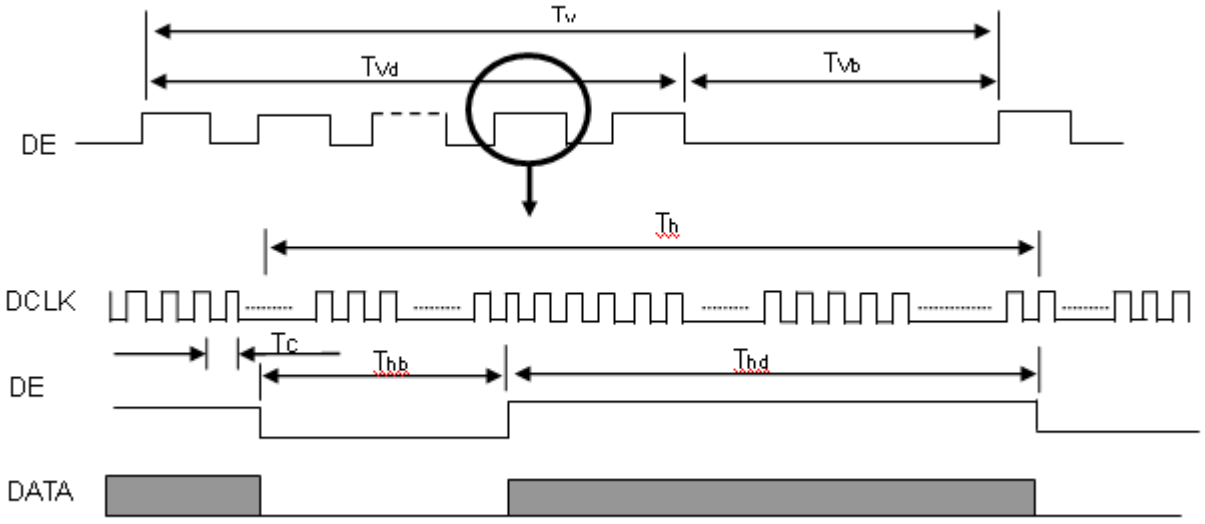
Fc = Fr X Tv X Th,

Fh(min.)=Fc(min.)/Th(min.), Fh(typ.)=Fc(typ.)/Th(typ.), Fh(max.)=Fc(max.)/Th(min.)

Please make sure the range of pixel clock has follow the below equation and Fc, Fr, Tv , Th, Fh not allowed to get beyond the min or max spec.

Max. Fc is including spread spectrum.

INPUT SIGNAL TIMING DIAGRAM



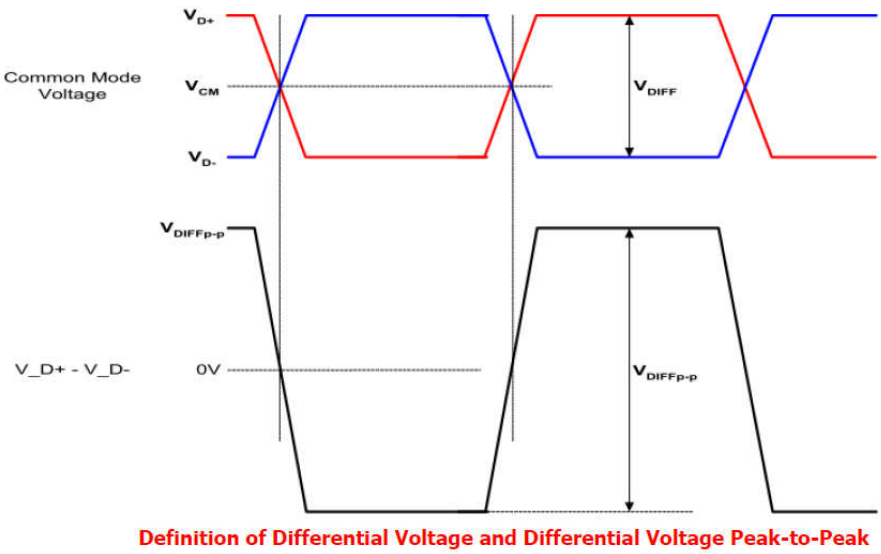
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4.6 eDP SIGNAL SPECIFICATIONS

4.6.1 eDP MAIN LINK SIGNAL

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Frequency for high bit rate (HBR2)	fHBR2	5.37138	5.4	5.40162	Gbps	
Spread spectrum clock (Down Spreading)	-	0	-	0.5	%	(6)
SSC modulation frequency	fssc	30	-	33	kHz	(6)
Differential peak to peak voltage at RX connector	VDIFFp-p	120	-	1320	mV	(1)
Rx input DC common mode voltage	VCM	0	-	2	V	(1)
Differential termination resistance	VRX-TERM	80	100	120	ohm	
Rx intra-pair skew at HBR2	tTOSK_Intra	-	-	50	ps	(3)
Rx inter-pair skew at HBR2	tTOSK_Inter	-(4UI+500ps)	-	(4UI+500ps)	ps	(4)
Main Link AC Coupling Capacitor	C_ML_Source	75	-	200	nF	(5)

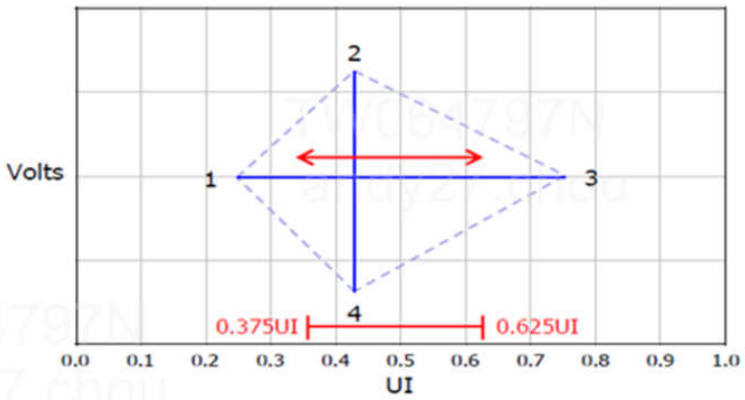
Note(1) Definition of Differential Voltage



Definition of Differential Voltage and Differential Voltage Peak-to-Peak

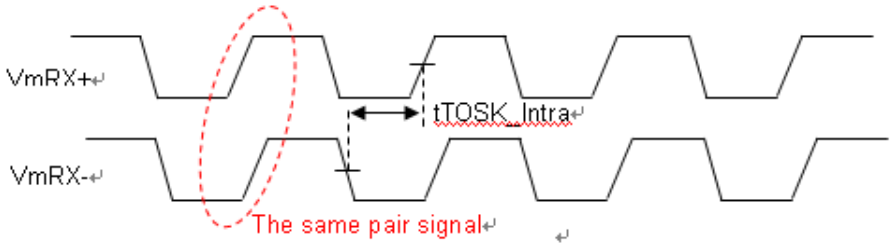
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Note(2) Main Link EYE Diagram

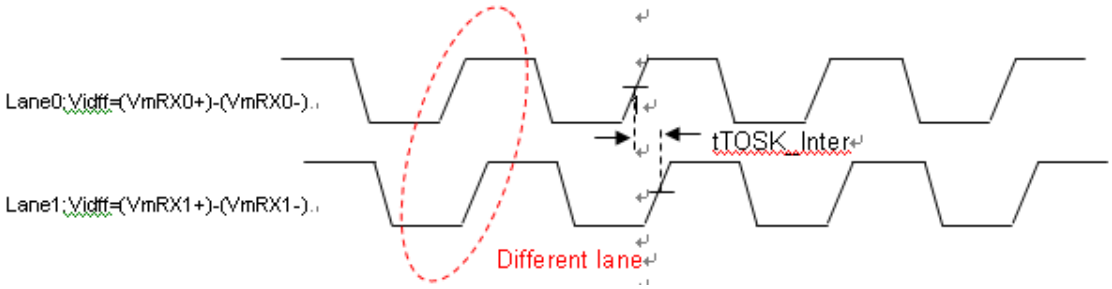


HBR2 @TP3_EQ		
Point	**Time(UI)**	**Voltage(V)**
1	Any UI locattion(x),where the Eye width is open from x to x+0.38UI	0.000
2	Any passing UI location between 0.375 and 0.625UI	0.045
3	Point 1+ 0.38UI	0.000
4	Same as Point 2	-0.045

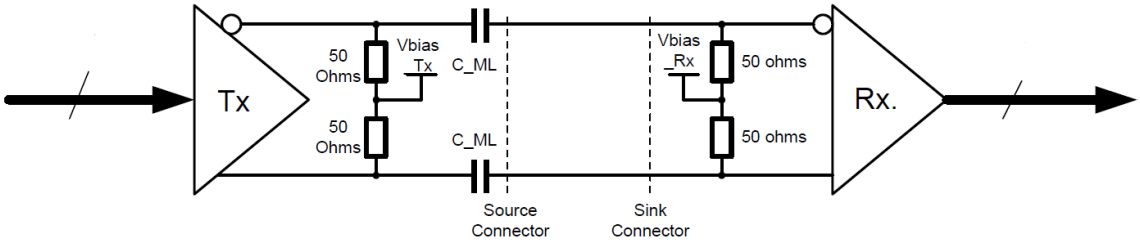
Note(3) eDP Intra-pair skew



Note(4) eDP Inter-pair skew

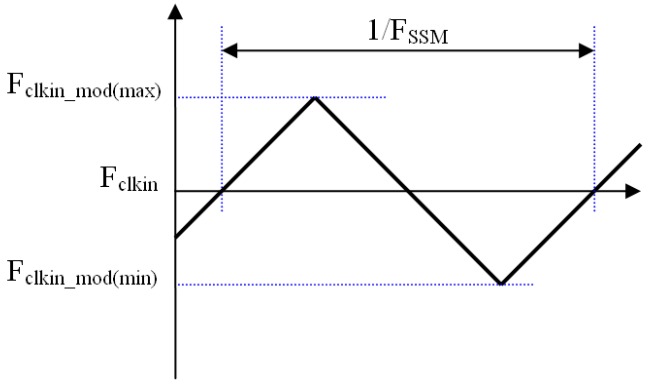


Note(5) Recommended Main Link Channel topology is as below and the Main Link AC Coupling Capacitor (C_ML_Source) should be placed on the source device



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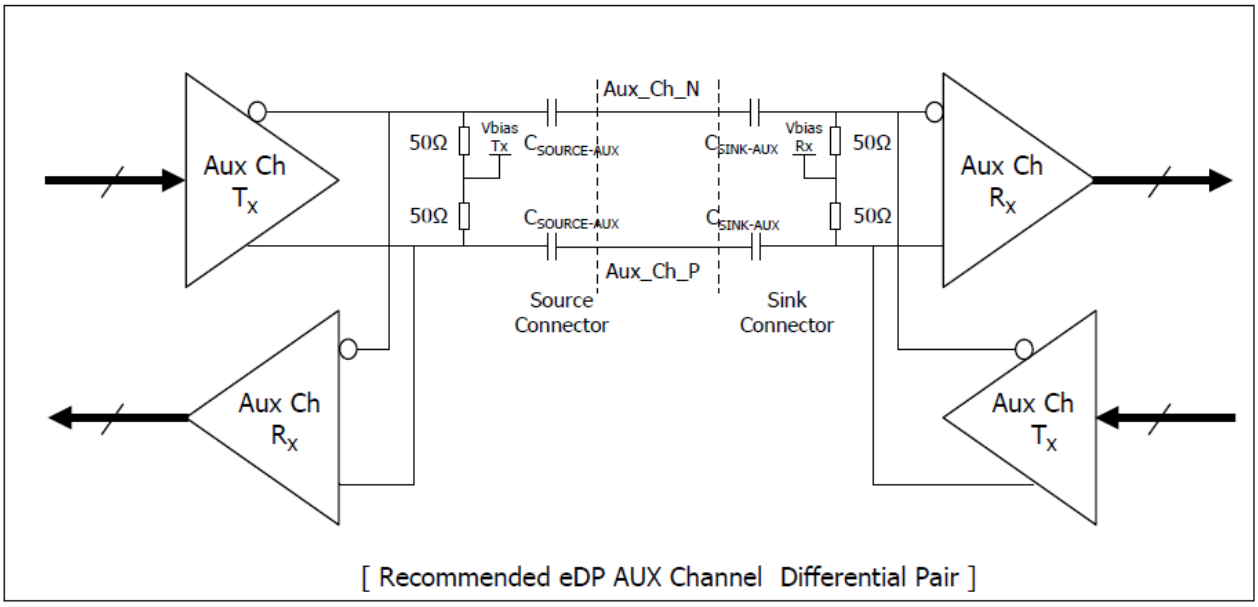
Note(6) The SSCG (Spread spectrum clock generator) is defined as below figures.



4.6.2 eDP AUX CHANNEL SIGNAL

Parameter	Symbol	Min	Typ	Max	Unit	Notes
AUX Unit Interval	UI	0.4	-	0.6	us	
AUX Jitter at Tx IC Pins	T jitter	-	-	0.04	UI	
AUX Jitter at Rx IC Pins	T jitter	-	-	0.05	UI	
AUX Peak-to-peak voltage at Connector Rx Pins	VAUX-DIFFp-p	0.27	-	1.36	V	
AUX Peak-to-peak voltage at Connector Tx Pins	VAUX-DIFFp-p	0.29	0.4	1.38	V	
AUX Differential termination resistance	AUX_dtr	80	100	120	ohm	(1)
AUX DC common mode voltage	VAUX_CM	0	-	1.2	V	
AUX AC Coupling Capacitor	C_Source_ Aux	75	-	200	nF	(1)

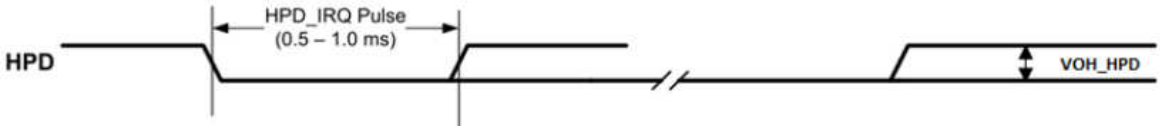
Notes(1) Recommended eDP AUX Channel topology is as below and the AUX AC Coupling Capacitor (C_Source _Aux) should be placed on the source device.



[Recommended eDP AUX Channel Differential Pair]

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4.6.3 eDP HPD SIGNAL

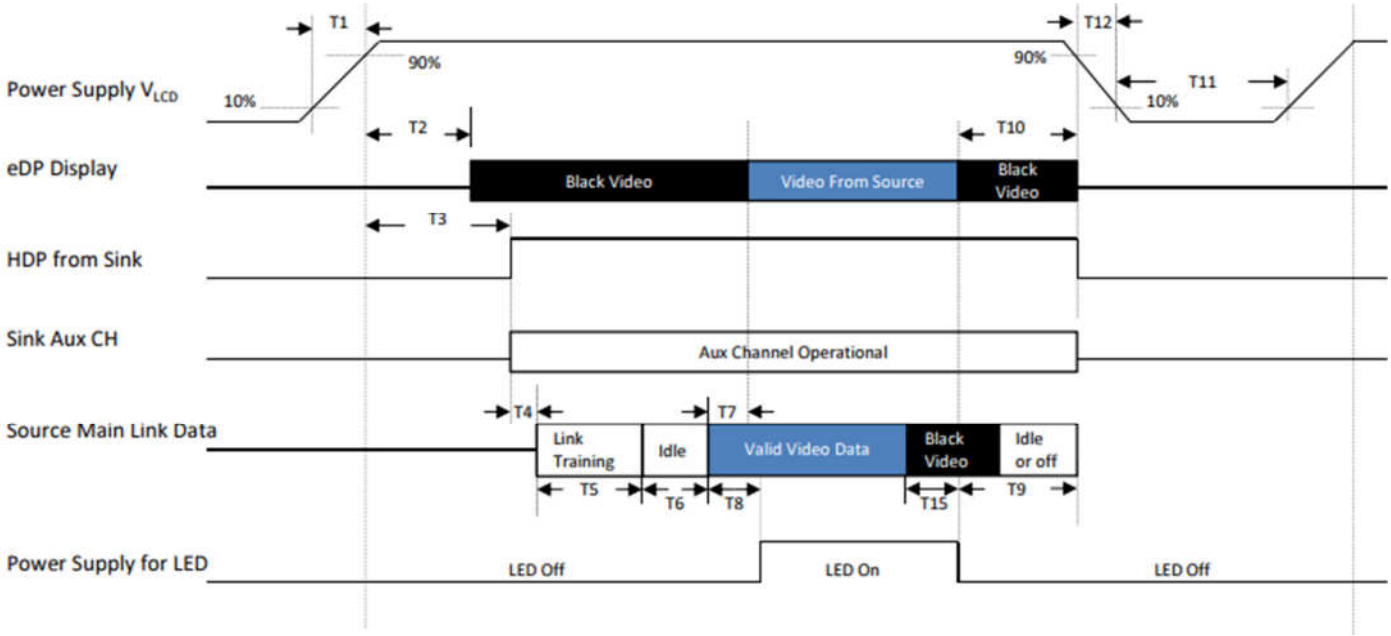


Parameter	Symbol	Min	Typ	Max	Unit
HPD Voltage	VOH_HPD	3.135	-	3.465	V
HPD_IRQ Pulse Width	HPD_IRQ	0.5	-	1	ms

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4.7 POWER ON/OFF SEQUENCE

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



Timing Specifications:

Timing	Required By	Min	Max	Units	Notes
T1	Source	0.5	10	ms	
T2	Sink	10	200	ms	
T3	Sink	15	200	ms	
T4	Source	0	-	ms	(7)
T5	Source	0	-	ms	(7)
T6	Source	0	100	ms	
T7	Sink	0	50	ms	
T8	Source	200	-	ms	
T9	Source	200	-	ms	(8)
T10	Source	50	500	ms	
T11	Source	1000	-	ms	
T12	Source	10	100	ms	
T15	Source	50	-	ms	

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Please insert a display black pattern during all T9. When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen and it will be no reliability concern(T9<200ms).

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance . If T2<0,that maybe cause electrical overstress failure.

Note (4) T11 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) Vcc must decay smoothly when power-off.

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Note (7) Link training duration is dependent on the customer's system.

Note (8) LED power must be turned off while video data signal is valid.

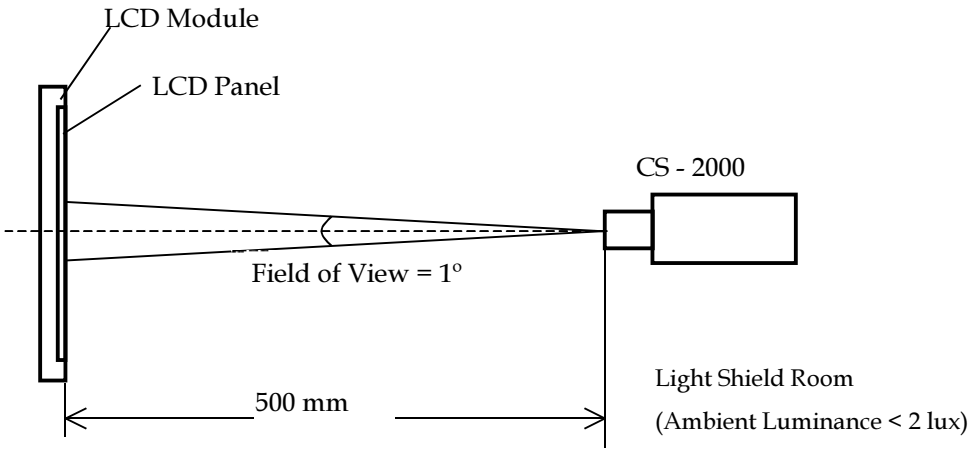
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5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	VCC	12±1.2	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Vertical Frame Rate	Fr	60	Hz

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.



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5.2 OPTICAL SPECIFICATIONS

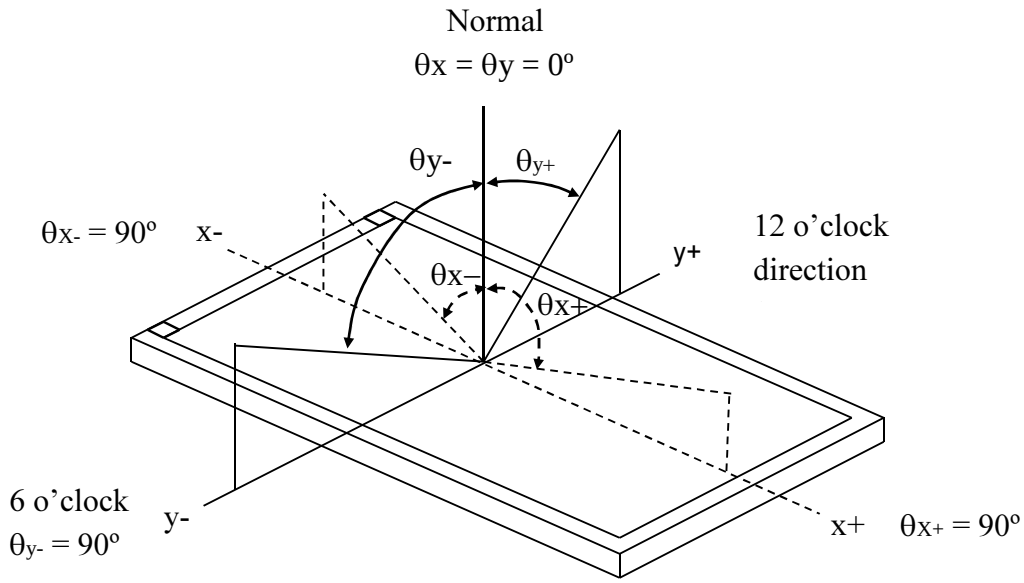
The relative measurement methods of optical characteristics are shown in 6.2. The following items should be measured under the test conditions described in 6.1 and stable environment shown in 6.1.

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing angle at normal direction	700	1000	-	-	(2)
Response Time		Gray to gray		-	14	-	ms	(3)
Center Luminance of White		L_C		560	700	-	cd/m^2	(4)
White Variation		δW				1.3	-	(6)
Cross Talk		CT		-		4	%	(5)
Color Chromaticity	Red	Rx		Typ.-0.03	0.675	Typ.+0.03	-	-
		Ry			0.319		-	
	Green	Gx			0.278		-	
		Gy			0.626		-	
	Blue	Bx			0.144		-	
		By			0.053		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
	Correlated color temperature			-	6500	-	K	
	Color Gamut	C.G.		-	95	-	%	DCI-P3
				-	85	-	%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥10	80	89	-	Deg.	(1)
		θ_x-		80	89	-		
	Vertical	θ_Y+		80	89	-		
		θ_Y-		80	89	-		

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

Viewing angles are measured by Autronic Conoscope Cono-80 (or Eldim EZ-Contrast 160R).



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

The contrast ratio can be calculated by the following expression.

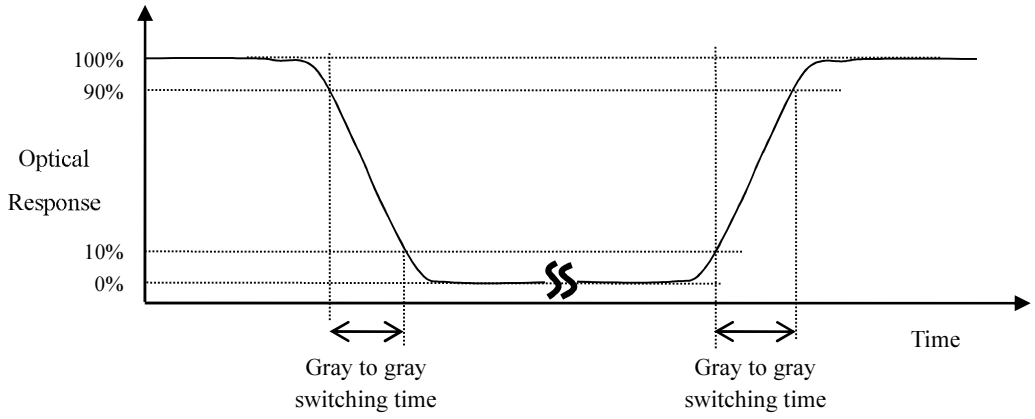
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

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 Gray-to-Gray Switching Time :



The driving signal means the signal of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255.

Gray to gray average time means the average switching time of gray level 0, 31, 63, 95, 127, 159, 191, 223 and 255 to each other.

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

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

LC = L (5), where L (X) is corresponding to the luminance of the point X at the figure in Note (6).

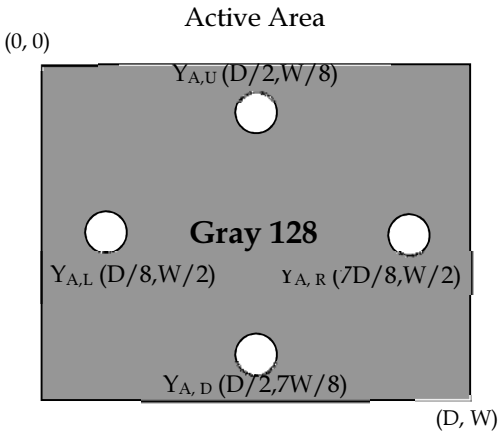
Note (5) Definition of Cross Talk (CT) :

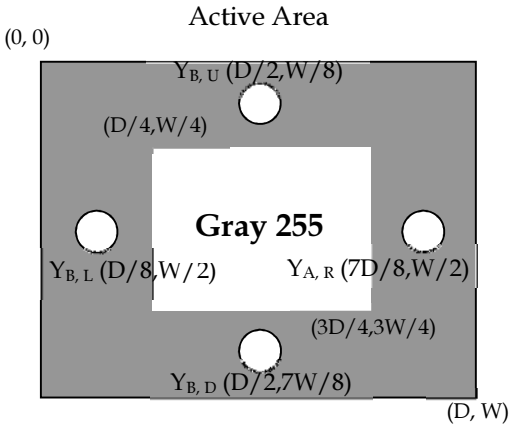
CT = | YB – YA | / YA × 100 (%)

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)

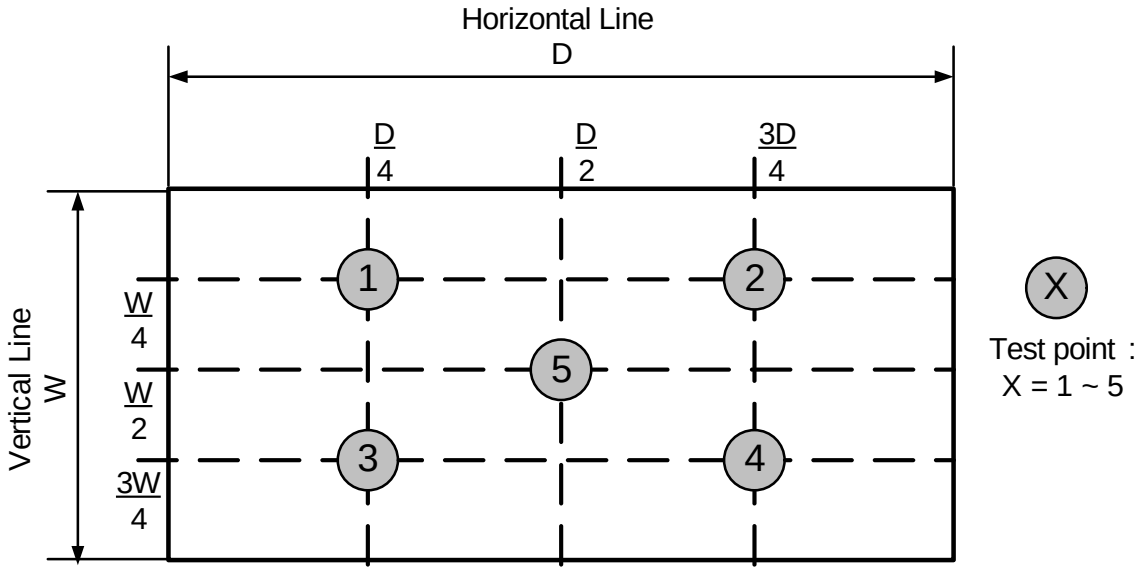




Note (6) Definition of White Variation (δW) :

Measure the luminance of gray level 255 at 5 points

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



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6. PRECAUTIONS

6.1 ASSEMBLY AND HANDLING PRECAUTIONS

[1] Do not apply rough force such as bending or twisting to the module during assembly.

[2] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

[3] Bezel of Set can not press or touch the panel surface. It will make light leakage or scrape.

[4] It should be attached to the system firmly using all mounting holes.

[5] 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, do not press or scratch the surface harder than a HB pencil lead.

[6] Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

[7] Protection film for polarizer on the module should be slowly peeled off just before use so that the electrostatic charge can be minimized.

[8] Do not disassemble the module.

[9] 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.

[10] Do not plug in or pull out the I/F connector while the module is in operation, pins of I/F connector should not be touched directly with bare hands. Do not adjust the variable resistor located on the module.

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

[11.1] 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 (under 70%) without condensation.

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

[12] Use a soft dry cloth without chemicals and Ethyl Alcohol for cleaning, because the surface of polarizer is very soft and easily scratched. Do not use Ketone type materials (ex. Acetone), Toluene, Ethyl acid or Methyl chloride, these chemical solvent might permanently damage the polarizer due to chemical action.

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

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6.2 SAFETY PRECAUTIONS

To optimize PID module's lifetime and functions, operating conditions should be followed as below

[1] Normal operating condition

[1.1] Well-ventilated place is suggested to set up PID module and system.

[1.2] Display pattern : regular switched patterns or moving pictures.

[2] Operation usage to protect against image sticking due to long-term static display.

[2.1] Liquid Crystal refresh time is required. Cycling display between 5 minutes' information (static) display and 10 seconds' moving image.

[2.2] Periodical display contents should be changed from static image to moving picture.

[2.2.1] Different background and image colors changed respectively, and changed colors periodically.

[2.2.2] Background and image with large different luminance displayed at the same time should be avoided.

[2.2.3] Periodical power-off the system for a while or screen saver is needed after long-term static display.

[2.2.4] Moving picture or black pattern is strongly recommended for screen saver.

[3] The startup voltage of a Backlight may cause an electrical shock while assembling with the converter. Do not disassemble the module or insert anything into the Backlight unit.

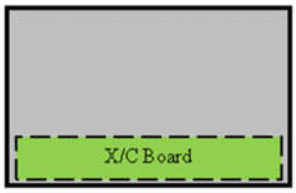
[4] Do not connect or disconnect the module in the "Power On" condition.

[5] Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature…) Otherwise the module may be damaged.

[6] 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.

[7] Module should be turned clockwise (regular front view perspective) when used in portrait mode.

Landscape (Front view)



Portrait (Front view)



[8] Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions, especially combining severe conditions such as high temperature/humidity, display stationary patterns, or long operation time etc…, it is strongly recommended to contact INX for field application engineering advice. Otherwise, the panel may be damaged and its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and full outdoor display.

[9] LCD system is required to place in well-ventilated environment. Adapting active cooling system is highly recommended.

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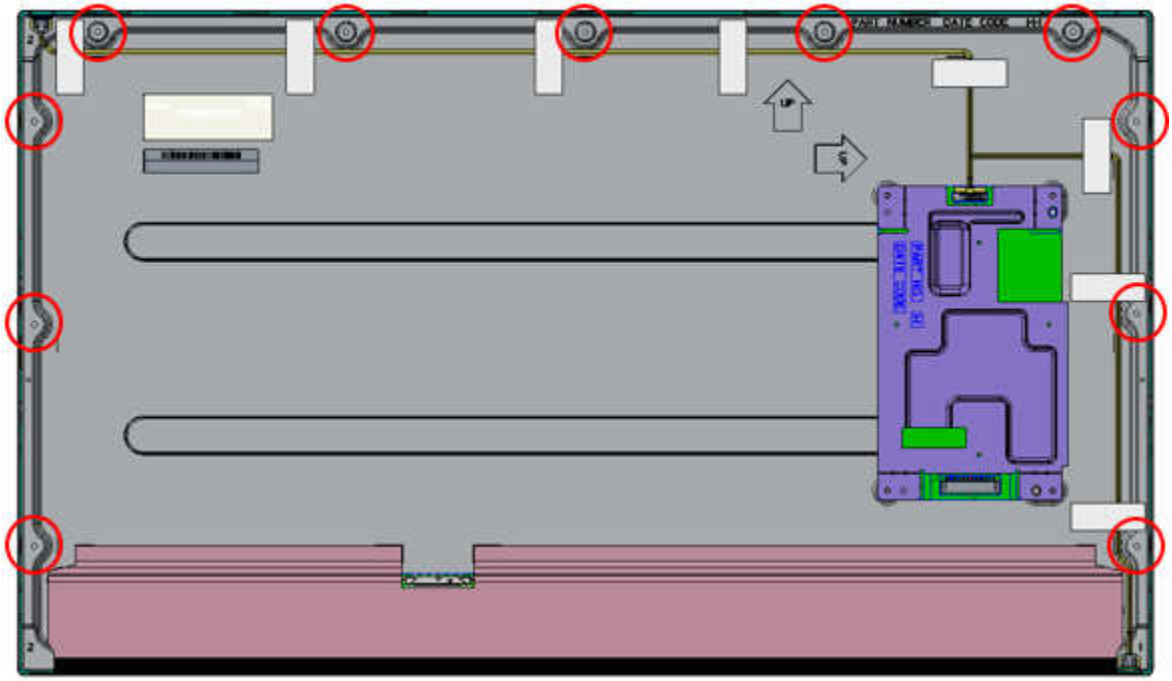
6.3 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

[1] Strong light exposure causes degradation of polarizer and color filter. Since the product design is not protected by an ultra-violet ray filter, the deterioration of the polarizer due to sun exposure or water drenching is not guarantee. It is necessary to set up cover-glass with ultraviolet resistance to protect panel from radiation of ambient environment.

6.4 DUST RESIST

[1] INX module dust test is conducted with marked holes (see Figure below, marked with red circle) sealed.

[2] Module users should design set with these holes used/sealed (if not used) or covered by set mechanism to prevent dust from entering. The INX testing procedure cannot replicate all different real world scenarious module users should apply set dust resistance solution to meet user's requirement.



6.5 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

Regulatory	Item	Standard
Audio/video, Information and Communication Technology Equipment	UL	UL 62368-1, 3rd Ed, 2021-10-22
	cUL	CAN/CSA C22.2 No. 62368-1:19, 3rd Ed, 2021-10-22
	CB	IEC 62368-1:2018 EN IEC 62368-1:2020+A11:2020

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7. DEFINITION OF LABELS

7.1 MODULE LABEL

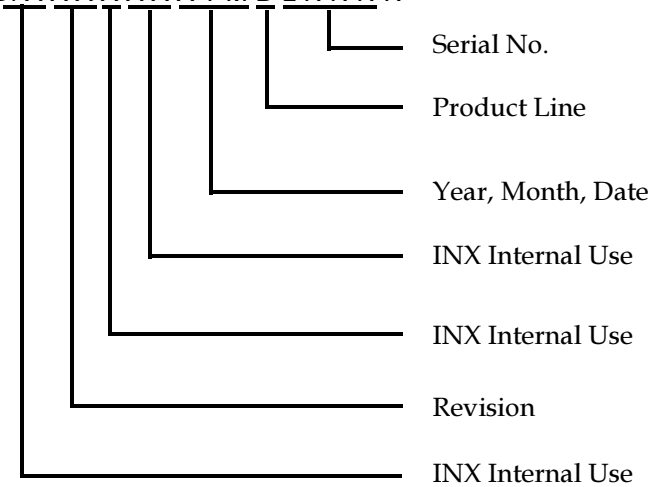
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: S270DR1-A01

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

(c) Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2020~2029
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.

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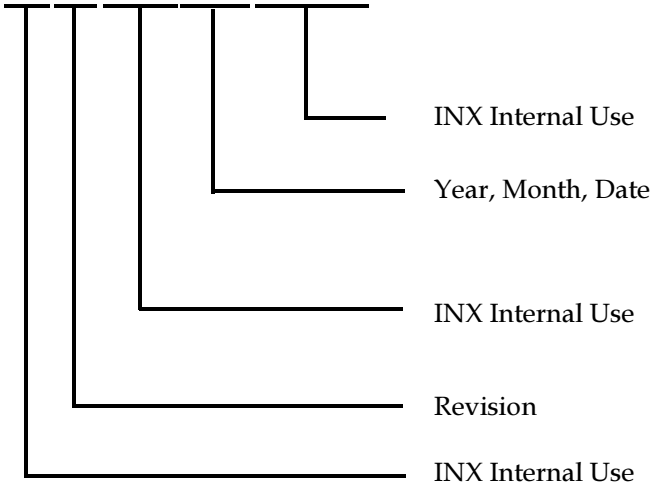
7.2 CARTON LABEL

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



Model Name: S270DR1-A01

Carton ID: X X X X X X X Y M D X X X X



Serial ID includes the information as below :

Manufactured Date:

Year: 2010=0, 2011=1, 2012=2…etc.

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

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8.PACKAGING

8.1 PACKAGING SPECIFICATIONS

(1) 12 LCD TV MODULES / 1 BOX

(2) BOX DIMENSIONS : 735(L) X 565(W) X 450(H)

(3) WEIGHT: APPROXIMATELY 33 KG (12 MODULES PER BOX)

8.2 PACKAGING METHOD

Packaging method is shown in following Figures 9-1 and 9-2

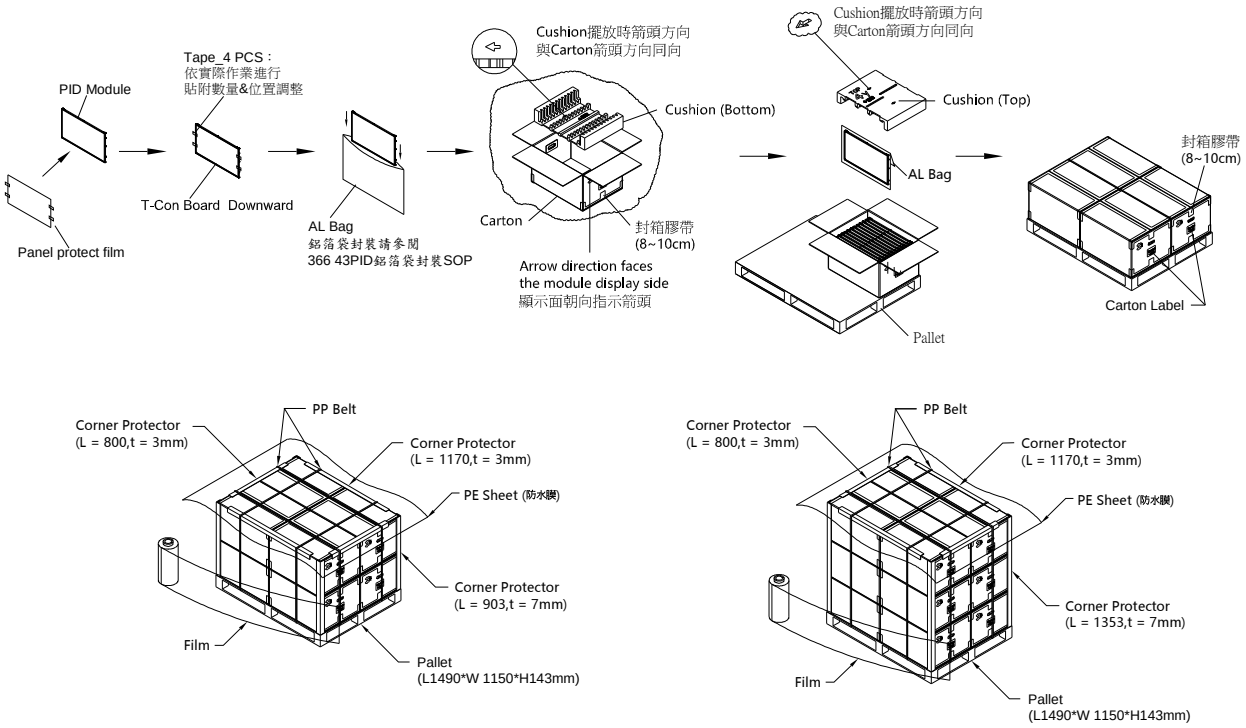


Figure 9-1 packaging method

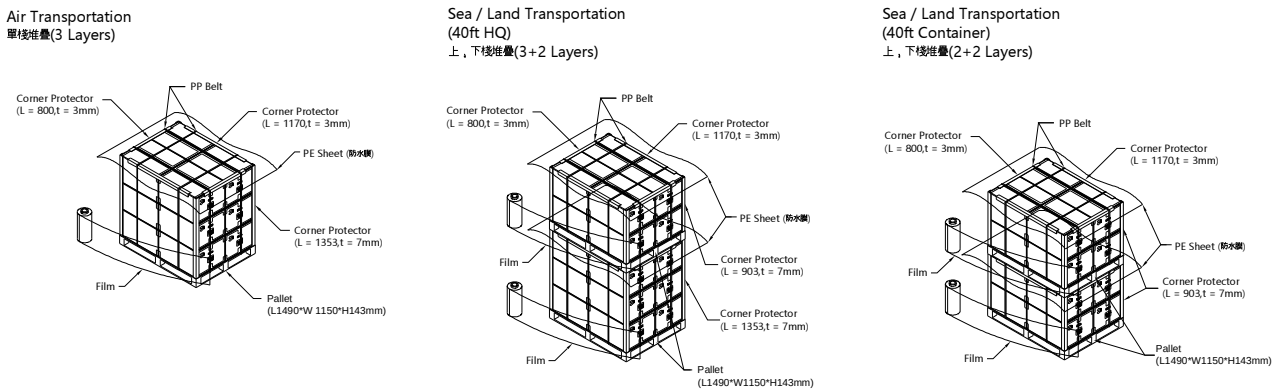


Figure. 9-2 packaging method

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8.3 UN-PACKAGING METHOD

Un-packaging method is shown in following Figure.9-3.

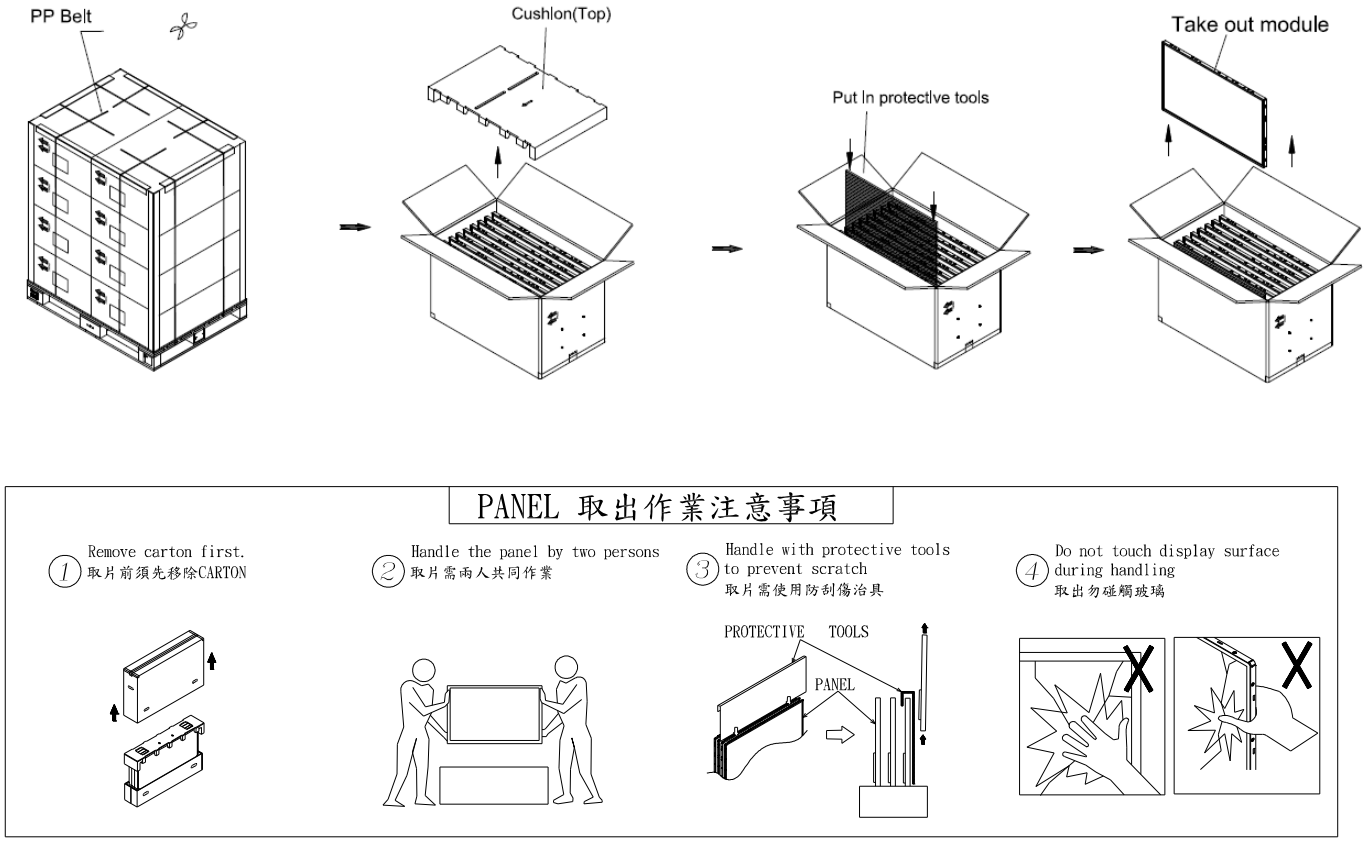
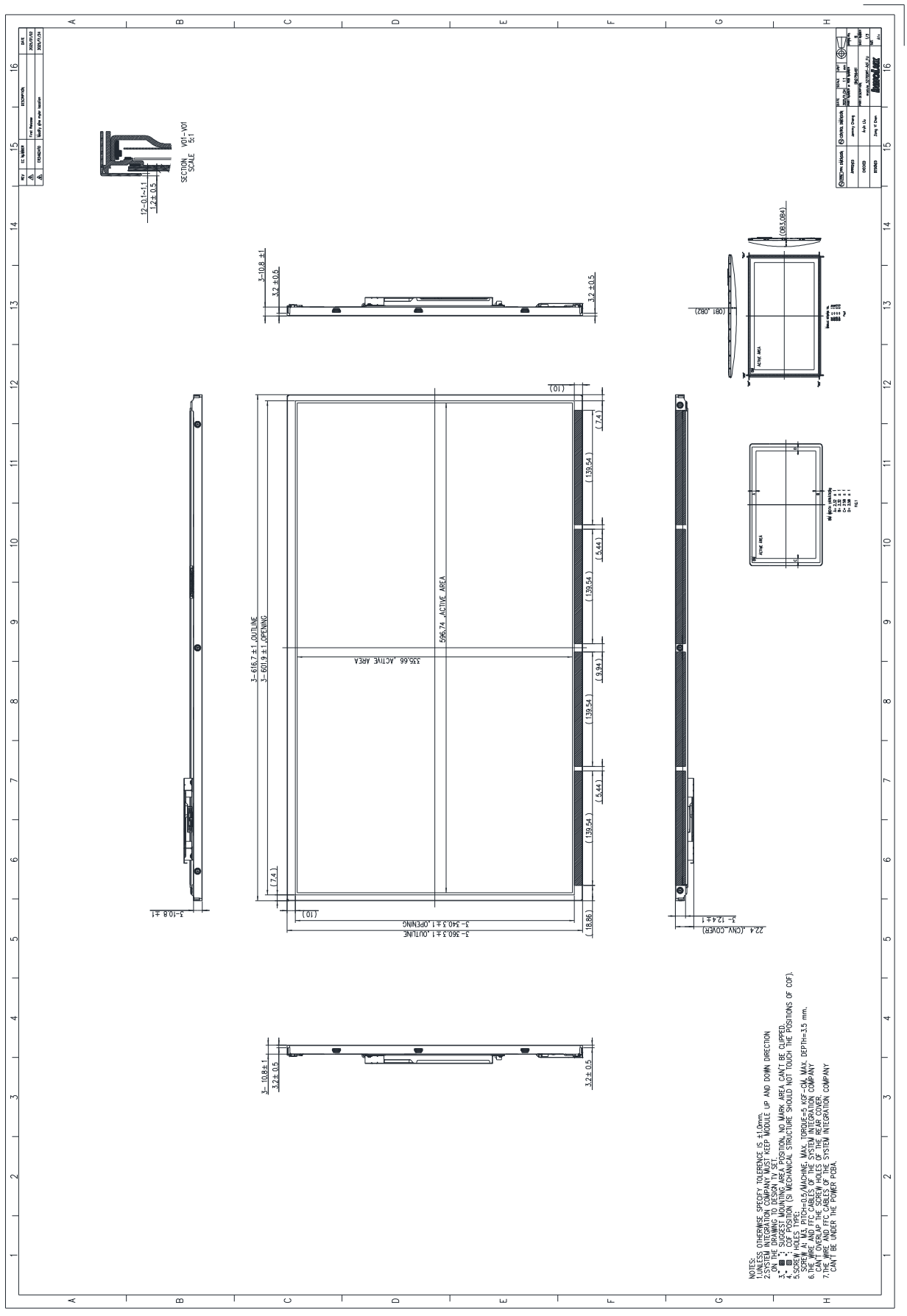


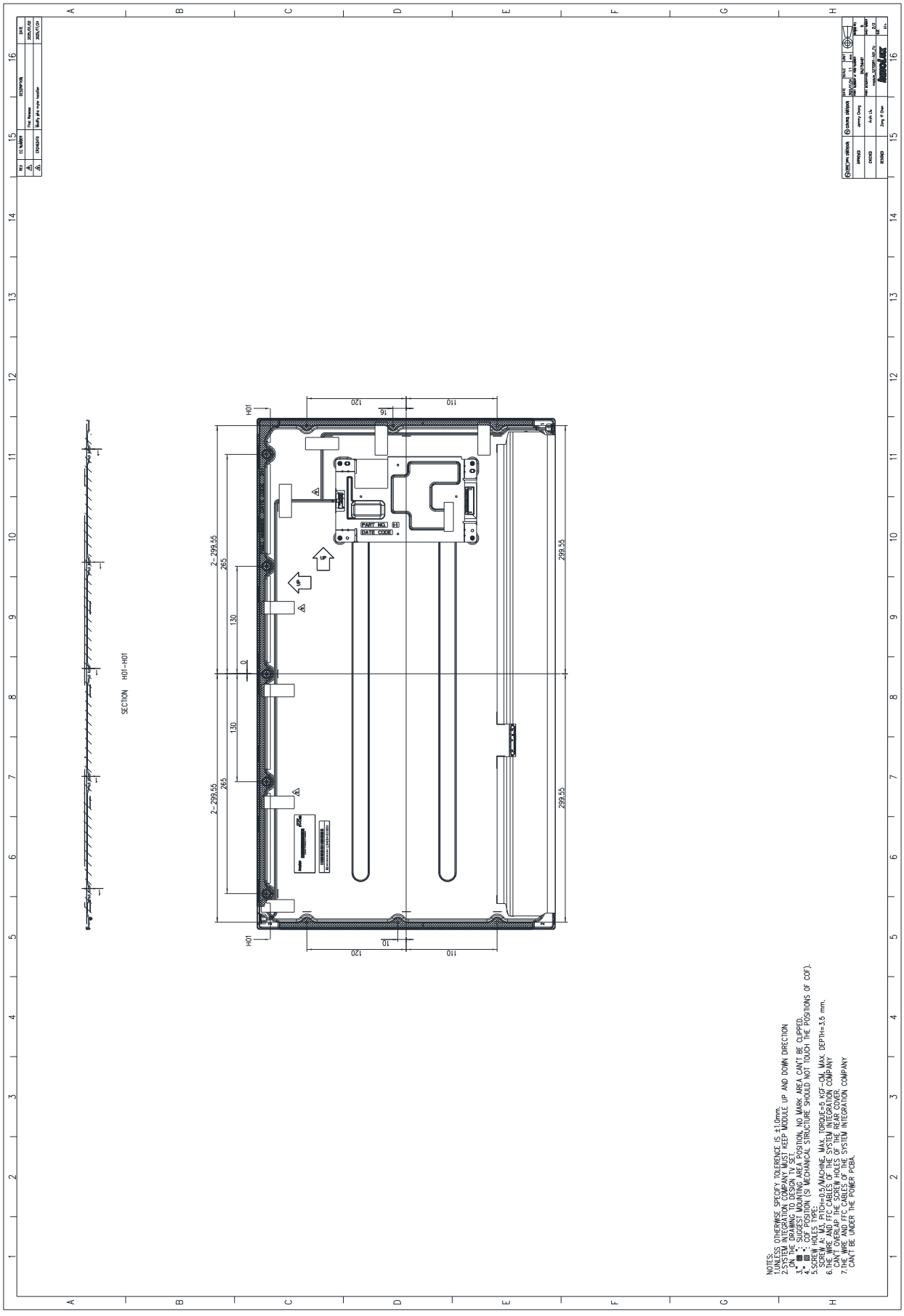
Figure. 9-3 un-packaging method

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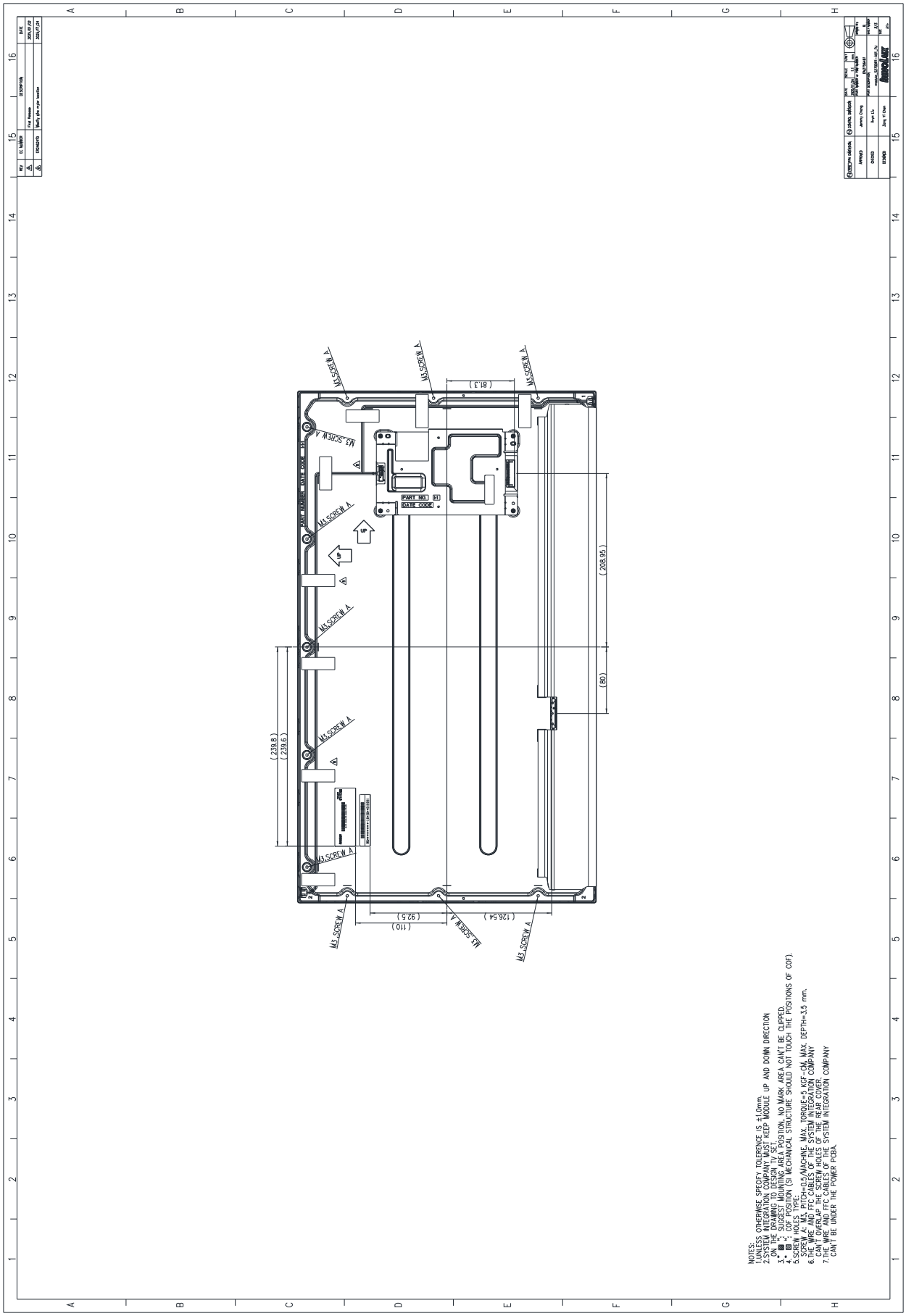
9. MECHANICAL CHARACTERISTIC



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