☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

MODEL NO.: V850DK1

SUFFIX: Q02

Revision : R2
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
Roger Huang	ChihFan Ting	Walter Hsieh

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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver. 2.0	Oct.5,2017	All	All	The Approval specification was first issued.

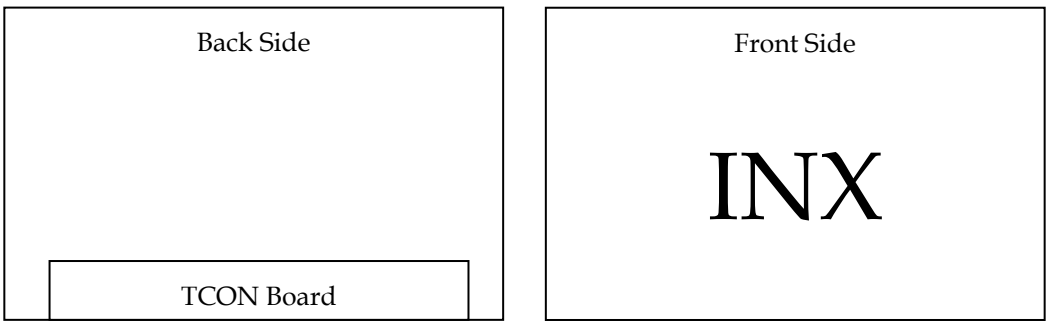
1. GENERAL DESCRIPTION

1.1 OVERVIEW

V850DK1-Q02 is a 84.5" TFT Liquid Crystal Display TV product with driver ICs and 16 Lane V-by-one interface. This product supports 3840 x 2160 QFHD TV format and can display true 1.07G colors (10-bit) . The backlight unit is not built in.

1.2 FEATURES

CHARACTERISTICS ITEMS	SPECIFICATIONS
Pixels [lines]	3840*2160
Active Area [mm]	1872(H)*1053(V)
Sub-Pixel Pitch [mm]	0.1625 (H) x 0.4875 (V)
Pixel Arrangement	RGB vertical stripe
Weight [g]	6000
Physical Size [mm]	1891(H) x 1072.4(V) x1.324(D)Typ
Display Mode	Transmissive mode / Normally black
Contrast Ratio	5000 :1 Typ. (Typical value measured at INX's module)
Glass thickness (Array / CF) [mm]	0.5/ 0.5
Viewing Angle (CR>20) (VA Model)	88(R)/88(L)/88(U)/88(D) Typ. (Typical value measured by INX's module)
Color Chromaticity	R=(0.669, 0.318) G=(0.266, 0.617) B=(0.136, 0.095) W=(0.297, 0.346) * Please refer to "color chromaticity" in 7.2
Cell Transparency [%]	4.8%Typ. Please refer to "Transmittance" in 7.2
Polarizer Surface Treatment	Anti-Glare coating (Haze 0.5%)
Rotation Function	Unachievable
Display Orientation	Signal input with "INX"
RoHs Compliance	

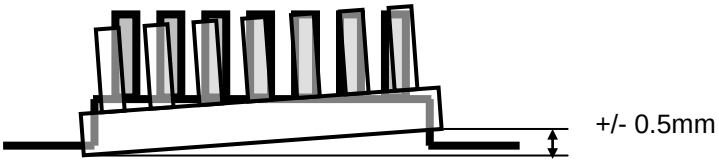


1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	**5434**	**5720**	**6006**	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ± 0.5mm as the horizontal.				(2)

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

Note (2) Connector mounting position



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	°C	(1), (3)
Operating Ambient Temperature	T_{OP}	0	50	°C	(1), (2), (3)

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

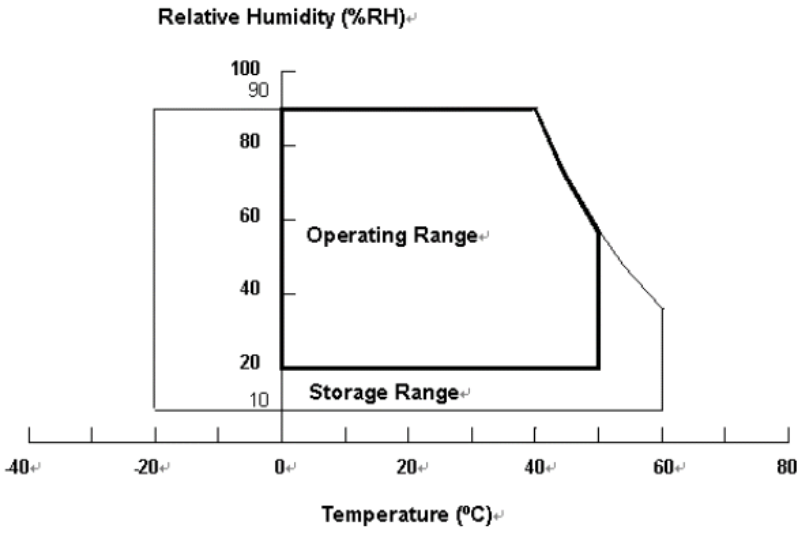
(a) 90 %RH Max. (Ta ≦ 40 °C).

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

(c) No condensation.

Note (2) Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 °C. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) The rating of environment is base on LCD module. Leave LCD cell alone, this environment condition can't be guaranteed. Except LCD cell, the customer has to consider the ability of other parts of LCD module and LCD module process.



2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

When storing open cell units, following procedures 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) If products delivered or kept in conditions of the recommended temperature or humidity, we recommend you leave them at a circumstance which is shown as below.

Period	1 month	2 months	3 months	4 months	5 months	6 months
Baking condition	No baking		50℃, 10%, 24 hrs	50℃, 10%, 48 hrs		

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	
Component thermal	-	-	100	℃	(2)

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) The surface temperature of Source Driver and component on PCB should be controlled under 100℃ operating over thermal spec can cause the damage or decrease of lifetime.

3. ELECTRICAL CHARACTERISTICS

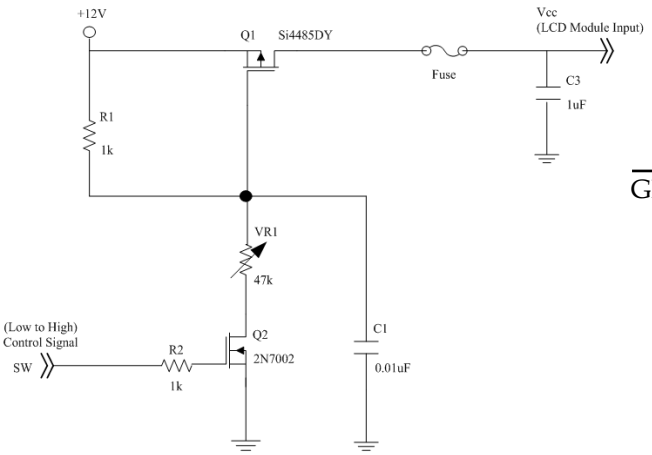
3.1 TFT LCD Module

(Ta = 25 ± 2 °C)

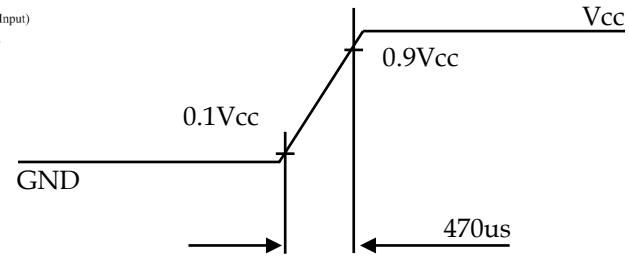
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	—	—	(7.83)	A	(2)
Power consumption	White Pattern	P_T	—	(18.52)	(20.37)	W	(3)
	Black Pattern	P_T	—	(18.63)	(20.49)		
	Heavy Loading pattern 2W2B (by cell and platform)	P_T	—	(59.62)	(65.58)		
Power Supply Current	White Pattern	P_T	—	(1.74)	(1.89)	A	
	Black Pattern	P_T	—	(1.72)	(1.86)		
	Heavy Loading pattern 2W2B (by cell and platform)	P_T	—	(5.76)	(6.24)		
VbyOne HS	Differential Input High Threshold Voltage	VLVTH	—	—	+50	mV	(4)
	Differential Input Low Threshold Voltage	VLVTL	-50	—	—	mV	
	Differential Input Resistor	RRIN	80	100	120	ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	—	3.6	V	
	Input Low Threshold Voltage	V_{IL}	0	—	0.7	V	

Note (1) The module should be always operated within the above ranges. The ripple voltage should be controlled under 10% of Vcc (Typ.).

Note (2) Measurement condition :

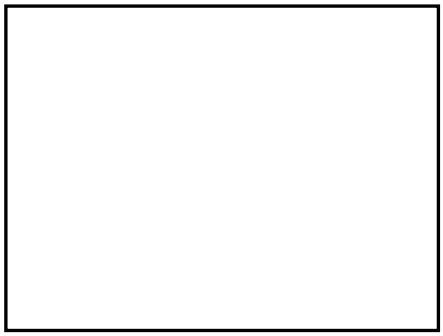


Vcc rising time is 470us



Note (3) The specified power consumption and power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 °C, f_v = 120 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

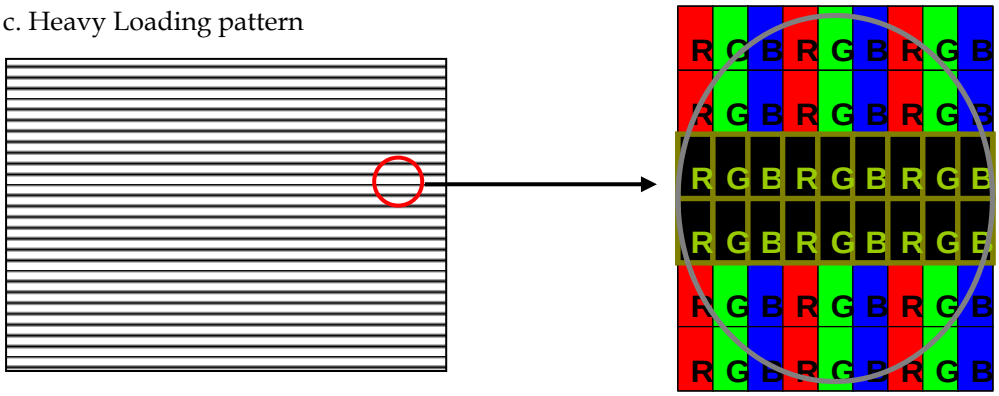


Active Area

b. Black Pattern

Active Area

c. Heavy Loading pattern



Note (4) At 50℃ environment temperature condition，the surface temperature of T-CON must be lower than 100℃

4. INPUT TERMINAL PIN ASSIGNMENT

4.1 TFT LCD OPEN CELL

CNC6 Connector Pin Assignment: [187059-51221(P-Two) , WF23-402-5133(FCN)]

Matting Connector : [FI-RE51HL (JAE)]

Pin	Name	Description	Note
1	N.C.	No Connection	(9)
2	N.C.	No Connection	
3	N.C.	No Connection	
4	N.C.	No Connection	
5	N.C.	No Connection	
6	N.C.	No Connection	
7	N.C.	No Connection	
8	N.C.	No Connection	
9	N.C.	No Connection	
10	GND	Ground	
11	GND	Ground	
12	GND	Ground	
13	GND	Ground	
14	GND	Ground	
15	L/R_O	Output signal for Glasses Left Right signal,	(4)
16	L/R_I	Input signal for Left/Right synchronous signal.	(3) (6)
17	2D/3D	2D/3D Enable	(2) (6)
18	SDA	I2C Data signal	(5)
19	SCL	I2C Clock signal	(5)
20	WP	Write Protection (0V~0.7V/Open→Disable, 2.7V~3.3V→Enable) (for Auto-Vcom)	
21	STV	STV output for local dimming use.	
22	N.C.	No Connection	(9)
23	TST_AGE	TST_AGE Enable(High level is enable aging mode)	(7)
24	N.C.	No Connection	(9)
25	HTPDN	Hot plug detect output, Open drain.	
26	LOCKN	Lock detect output, Open drain.	
27	GND	Ground	
28	RX0N	1ST Pixel Negative VbyOne differential data input in area A. Lan 0	(1)
29	RX0P	1ST Pixel Positive VbyOne differential data input in area A. Lan 0	
30	GND	Ground	
31	RX1N	2ND Pixel Negative VbyOne differential data input in area A. Lan 1	(1)

32	RX1P	2ND Pixel Positive VbyOne differential data input in area A. Lan 1	
33	GND	Ground	
34	RX2N	3RD Pixel Negative VbyOne differential data input in area A. Lan 2	(1)
35	RX2P	3RD Pixel Positive VbyOne differential data input in area A. Lan 2	
36	GND	Ground	
37	RX3N	4TH Pixel Negative VbyOne differential data input in area A. Lan 3	(1)
38	RX3P	4TH Pixel Positive VbyOne differential data input in area A. Lan 3	
39	GND	Ground	
40	RX4N	5TH Pixel Negative VbyOne differential data input in area A. Lan 4	(1)
41	RX4P	5TH Pixel Positive VbyOne differential data input in area A. Lan 4	
42	GND	Ground	
43	RX5N	6TH Pixel Negative VbyOne differential data input in area A. Lan 5	(1)
44	RX5P	6TH Pixel Positive VbyOne differential data input in area A. Lan 5	
45	GND	Ground	
46	RX6N	7TH Pixel Negative VbyOne differential data input in area A. Lan 6	(1)
47	RX6P	7TH Pixel Positive VbyOne differential data input in area A. Lan 6	
48	GND	Ground	
49	RX7N	8TH Pixel Negative VbyOne differential data input in area A. Lan 7	(1)
50	RX7P	8TH Pixel Positive VbyOne differential data input in area A. Lan 7	
51	GND	Ground	

CNC7 Connector Pin Assignment: [187060-41221(P-TWO) , WF23-400-413C(FCN)]

Matting Connector : [FI-RE41HL(JAE)]

Pin	Name	Description	Note
1	GND	Ground	
2	RX8N	1ST Pixel Negative VbyOne differential data input in area A. Lan 0	(1)
3	RX8P	1ST Pixel Positive VbyOne differential data input in area A. Lan 0	
4	GND	Ground	
5	RX9N	2ND Pixel Negative VbyOne differential data input in area A. Lan 1	(1)
6	RX9P	2ND Pixel Positive VbyOne differential data input in area A. Lan 1	
7	GND	Ground	
8	RX10N	3RD Pixel Negative VbyOne differential data input in area A. Lan 2	(1)
9	RX10P	3RD Pixel Positive VbyOne differential data input in area A. Lan 2	

10	GND	Ground	
11	RX11N	4TH Pixel Negative VbyOne differential data input in area A. Lan 3	(1)
12	RX11P	4TH Pixel Positive VbyOne differential data input in area A. Lan 3	
13	GND	Ground	
14	RX12N	5TH Pixel Negative VbyOne differential data input in area A. Lan 4	(1)
15	RX12P	5TH Pixel Positive VbyOne differential data input in area A. Lan 4	
16	GND	Ground	
17	RX13N	6TH Pixel Negative VbyOne differential data input in area A. Lan 5	(1)
18	RX13P	6TH Pixel Positive VbyOne differential data input in area A. Lan 5	
19	GND	Ground	
20	RX14N	7TH Pixel Negative VbyOne differential data input in area A. Lan 6	(1)
21	RX14P	7TH Pixel Positive VbyOne differential data input in area A. Lan 6	
22	GND	Ground	
23	RX15N	8TH Pixel Negative VbyOne differential data input in area A. Lan 7	(1)
24	RX15P	8TH Pixel Positive VbyOne differential data input in area A. Lan 7	
25	GND	Ground	
26	N.C.	No Connection	(9)
27	N.C.	No Connection	
28	N.C.	No Connection	
29	N.C.	No Connection	
30	N.C.	No Connection	
31	N.C.	No Connection	
32	N.C.	No Connection	
33	N.C.	No Connection	
34	N.C.	No Connection	
35	N.C.	No Connection	
36	N.C.	No Connection	
37	N.C.	No Connection	
38	N.C.	No Connection	
39	N.C.	No Connection	
40	N.C.	No Connection	
41	N.C.	No Connection	

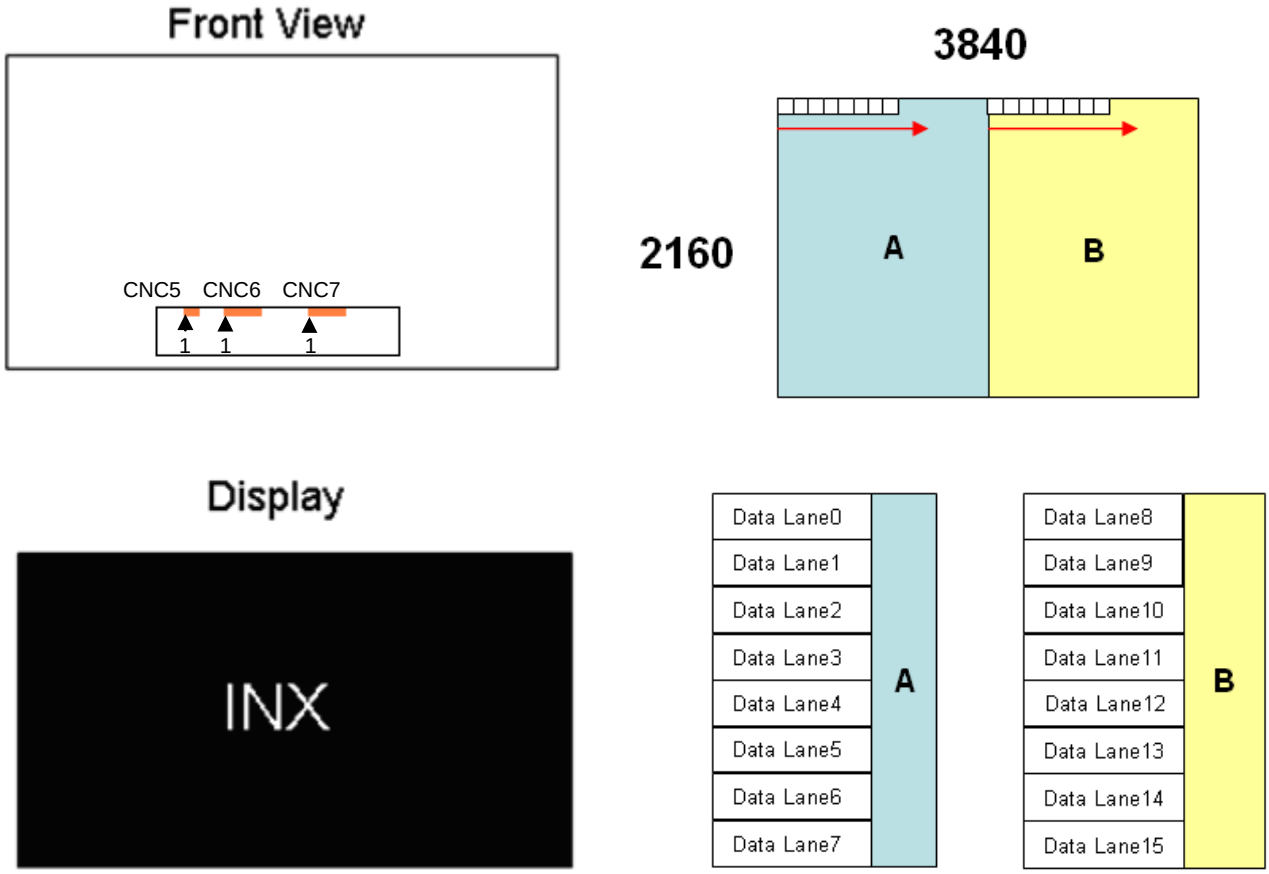
CNC5 Connector Pin Assignment: [CI0105M1HR0-LA-NH(瀚荃) , JH2-D4-053N(全康-FCN)]

Matting connector : [PHR5(JST)]

1	GND	Ground	
2	GND	Ground	
3	Vin	Power input (+12V)	(10)
4	Vin	Power input (+12V)	
5	Vin	Power input (+12V)	

Note (1) V-by-One® HS Data Mapping

Area	Lane	Data Stream
A	Lane 0	1, 9, 17, ..., 1905, 1913
	Lane 1	2, 10, 18, ..., 1906, 1914
	Lane 2	3, 11, 19, ..., 1907, 1915
	Lane 3	4, 12, 20, ..., 1908, 1916
	Lane 4	5, 13, 21, ..., 1909, 1917
	Lane 5	6, 14, 22, ..., 1910, 1918
	Lane 6	7, 15, 23, ..., 1911, 1919
	Lane7	8, 16, 24, ..., 1912, 1920
B	Lane 8	1921, 1929, 1937, ..., 3825, 3833
	Lane 9	1922, 1930, 1938, ..., 3826, 3834
	Lane 10	1923, 1931, 1939, ..., 3827, 3835
	Lane 11	1924, 1932, 1940, ..., 3828, 3836
	Lane12	1925, 1933, 1941, ..., 3829, 3837
	Lane 13	1926, 1934, 1942, ..., 3830, 3838
	Lane 14	1927, 1935, 1943, ..., 3831, 3839
	Lane 15	1928, 1936, 1944, ..., 3832, 3840



Note (2) 2D/3D mode selection.

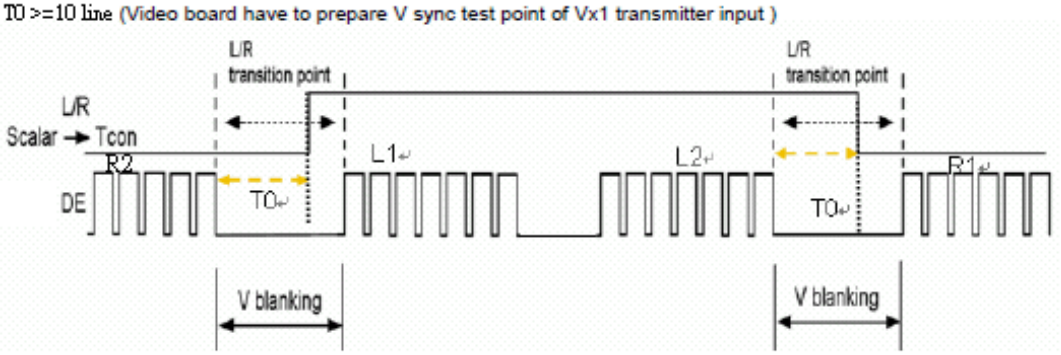
L= Connect to GND or Open, H=Connect to +3.3V

2D/3D	Note
L or Open	2D Mode
H	3D Mode

Note (3) Input signal for Left Right eye frame synchronous

V_{IL}=0~0.8 V, V_{IH}=2.0~3.3 V

L/R	Note
L	Right synchronous signal
H	Left synchronous signal

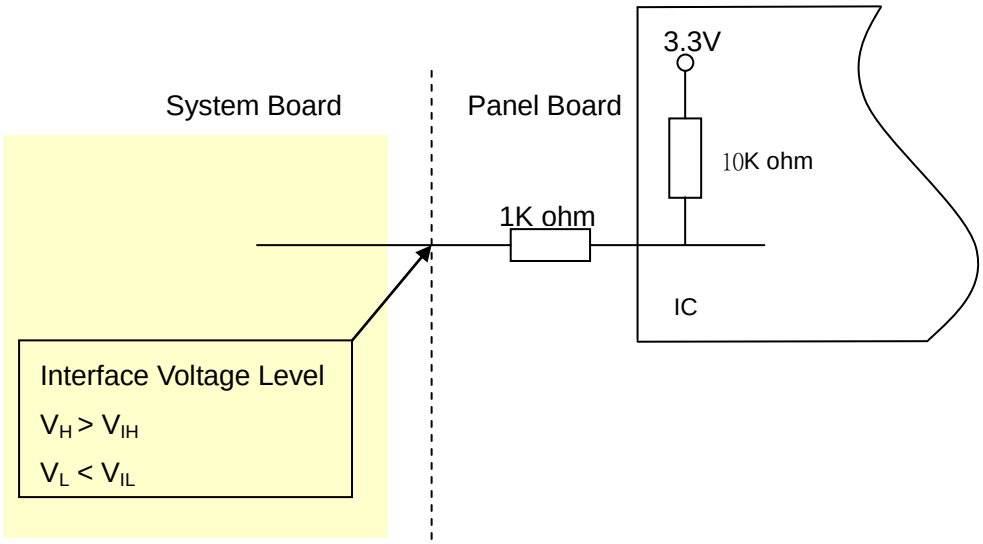


Note (4) The definition of L/R_O signal as follows

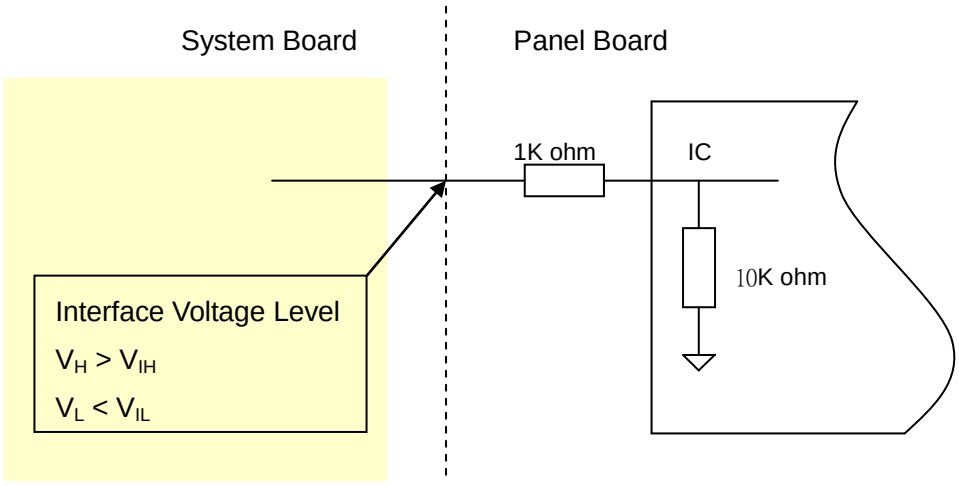
L= 0V , H= +3.3V

L/R_O	Note
L	Right glass turn on
H	Left glass turn on

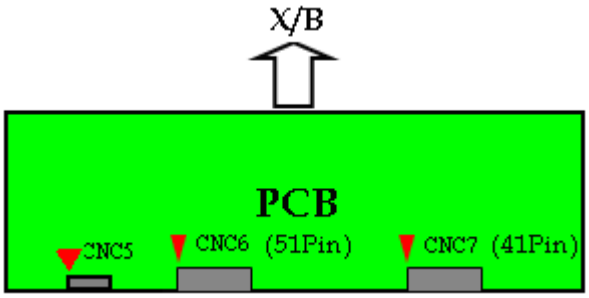
Note (5) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.



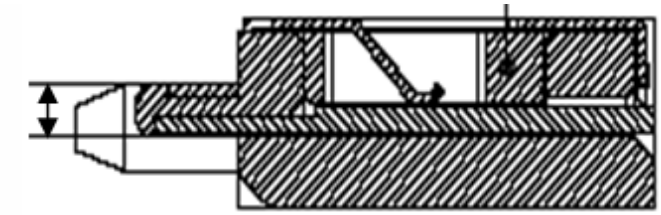
Note (6) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.



Note (7) VbyOne HS connector pin order defined as follows



Note (8) V-by-One connector mating dimension range request is 0.93mm~1.0mm as below



Note (9) Reserved for internal use. Please leave it open.

Note (10) Power input (+12V), Please check the current rating of FFC cable to meet the power consumption requirement.

4.2 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	1	0	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	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
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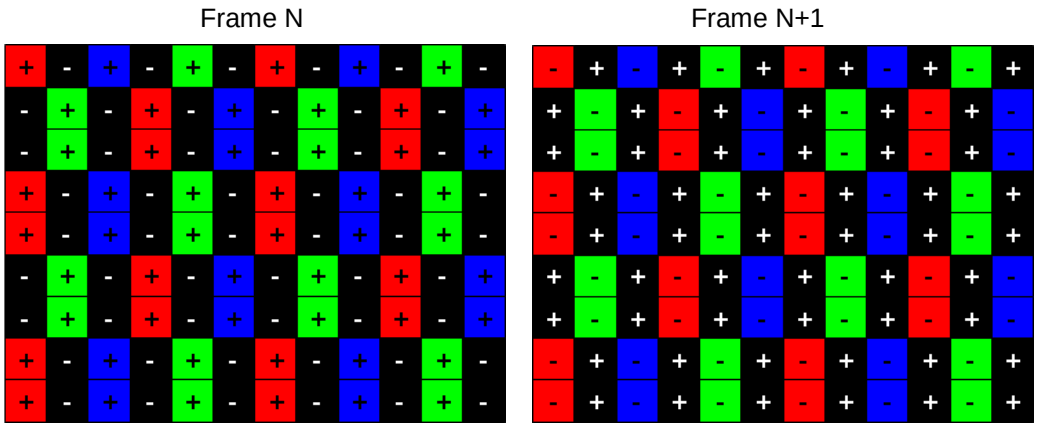
	Green (1021)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	Green (1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

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

4.3 FLICKER (Vcom) ADJUSTMENT

(1) Adjustment Pattern:

1H2V sub-pixel on/off pattern was shown as below. If customer need below pattern, please directly contact with Account FAE.



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

Programmable memory IC is used for Digital V-com adjustment in this model. INX provide Auto Vcom tools to adjust Digital V-com.The detail connection and setting instruction, please directly contact with Account FAE or refer INX 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

5. INTERFACE TIMING

5.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram. (Ta = 25 ± 2 ºC)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frequency	Data Clock	1/Tc	70	76.95	80	MHz	(1)
VbyOne Receiver	Data skew between each area (A/B)	Tblock	-0.06	—	0.06	H	(2)
	Intra-Pair skew		-0.3	—	0.3	UI	(3)
	Inter-pair skew		-5	—	5	UI	(4)
	Spread spectrum modulation range	F_{clkin_mod}	1/Tc-0.5%	—	1/Tc+0.5%	MHz	(5)
	Spread spectrum modulation frequency	F_{SSM}	—	—	30	KHz	

5.1.1 Timing spec for Frame Rate=100Hz

Frame rate	2D mode		Fr5	94	100	106	Hz	
Vertical Active Display Term (8 Lan,1920X2160 Active Area)	2D Mode	Total	Tv	2200	2700	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160	2160	2160	Th	
		Blank	Tvb	40	540	630	Th	
Horizontal Active Display Term (8 Lan,1920X2160 Active Area)	2D Mode	Total	Th	270	285	300	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	
		Blank	Thb	30	45	60	Tc	

5.1.2 Timing spec for Frame Rate=120Hz

Frame rate	2D mode		Fr6	114	120	126	Hz	
	3D mode		Fr6	240	240	240	Hz	
Vertical Active Display Term (8 Lan, 1920X2160 Active Area)	2D Mode	Total	Tv	2200	2250	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160	2160	2160	Th	—
		Blank	Tvb	40	90	630	Th	—
	3D Mode	Total	Tv	1115	1125	1155	Th	(6)
		Display	Tvd	1080				
		Blank	Tvb	35	45	75	Th	

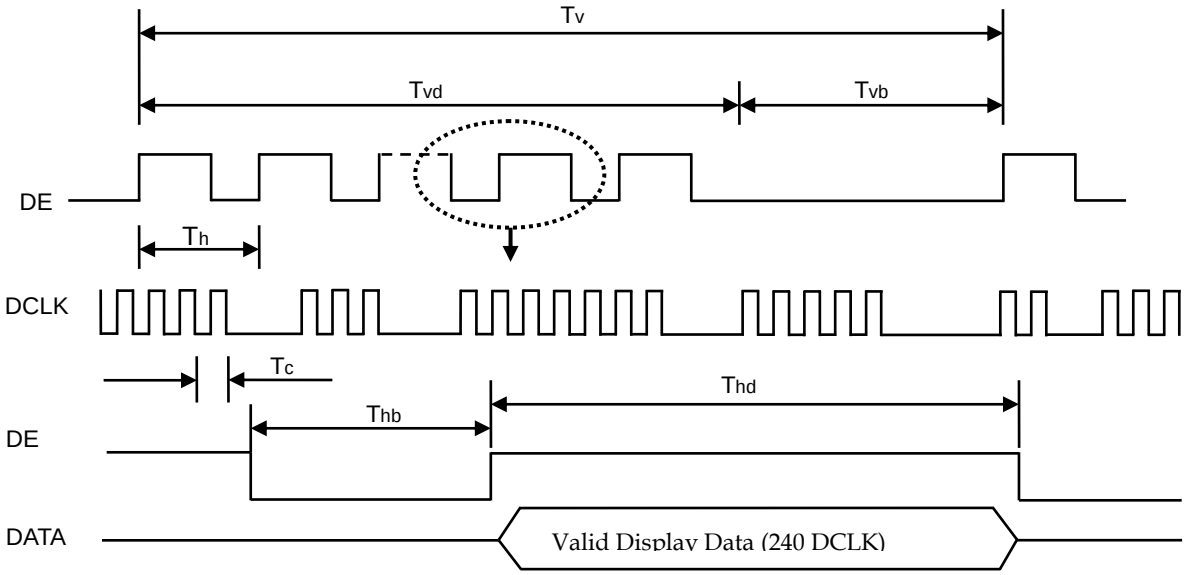
Horizontal Active Display Term (8 Lan, 1920X2160 Active Area)	2D Mode	Total	Th	270	285	300	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	—
		Blank	Thb	30	45	60	Tc	—
	3D Mode	Total	Th	270	285	300	Tc	Th=Thd+Thb
		Display	Thd	240	240	240	Tc	—
		Blank	Thb	30	45	60	Tc	—

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

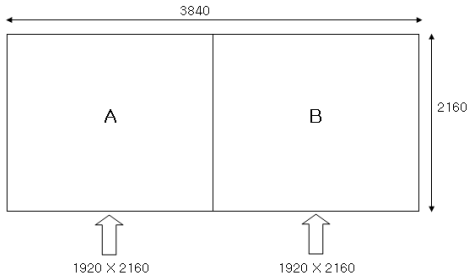
Fclkin(max) ≧ Fr × Tv × Th

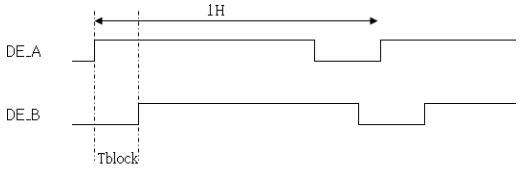
Fr × Tv × Th ≧ Fclkin (min)

INPUT SIGNAL TIMING DIAGRAM

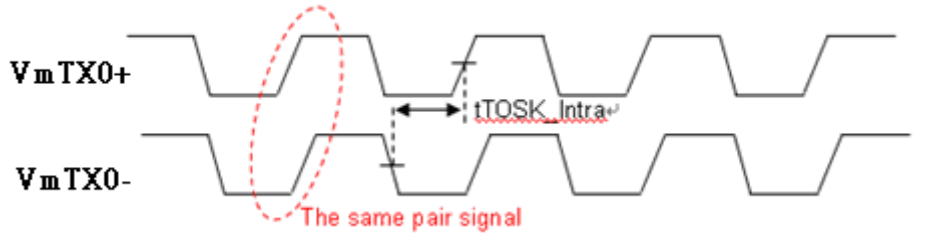


Note (2) Data skew between areas

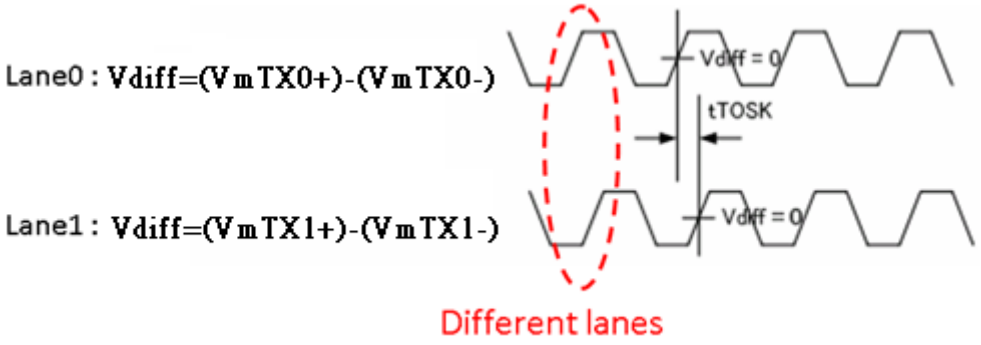




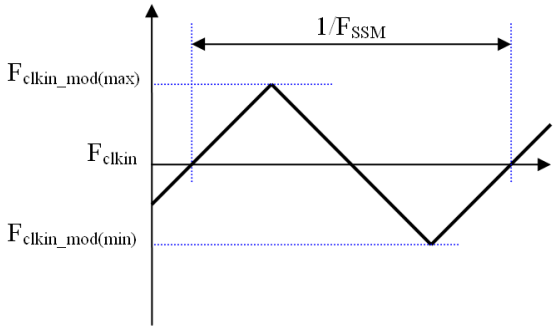
Note (3) VbyOne HS Intra-pair skew



Note (4) VbyOne HS Inter-pair skew.



Note (5) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (6) INX suggest to fix the vertical timing (Vertical Total =1125 / Display =1080 / Blank = 45) & frame rate 240Hz in 3D mode. According to customer request, we agreed to modify the 3D mode timing specification. If your application is not in our recommended value (Vertical Total =1125 / Display =1080 / Blank = 45 / Frame rate 240Hz). INX can not guarantee the 3D mode performance.

5.2 Timing Diagram

5.2.1 V by One Signal Timing Diagram

The eye diagram is measured by the oscilloscope and receiver CDR characteristic must be emulated.

PLL bandwidth : 40MHz

Damping factor : 1.4

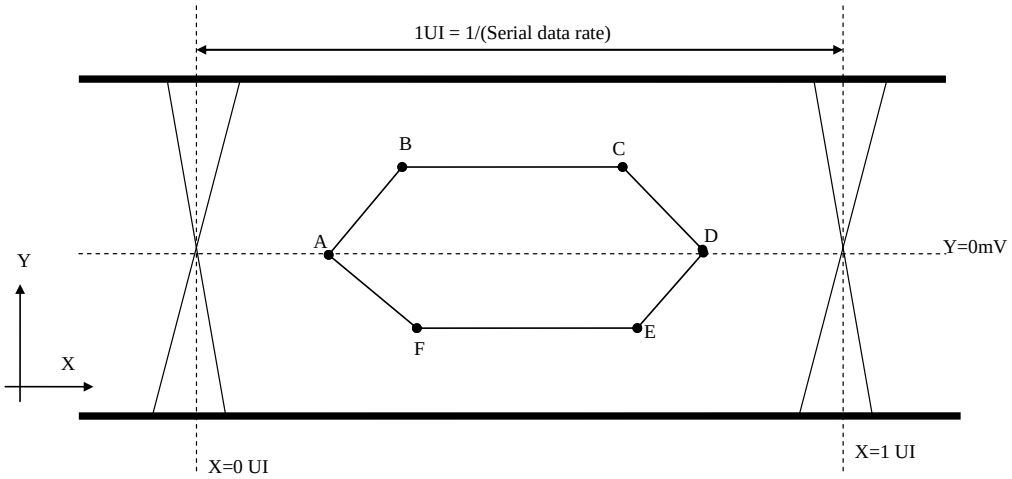


Table 1 Eye Mask Specification

	X [UI]	Y [mV]	Note
A	0.25	0	
B	0.3	50	
C	0.7	50	
D	0.75	0	
E	0.7	-50	
F	0.3	-50	

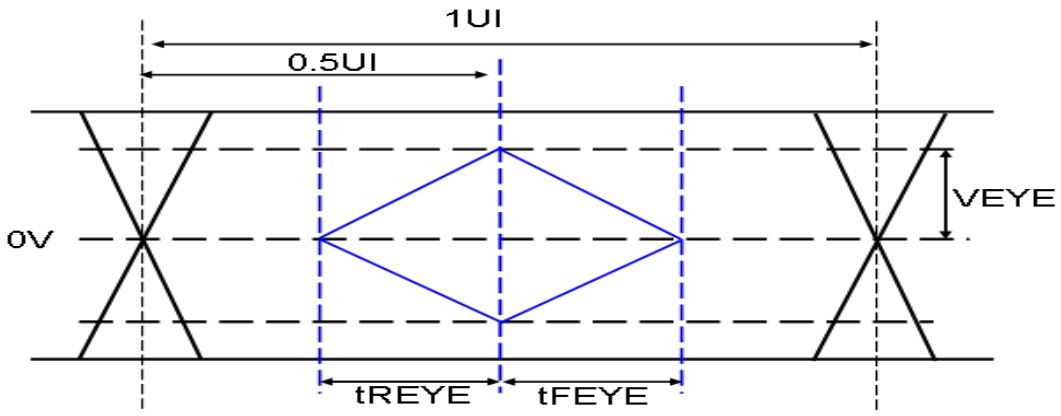
5.2.2 CMPI Signal Timing Diagram

(1) CMPI AC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Effective Veye Rising Time	tREYE	0.2	-	-	UI	
Effective Veye Falling Time	tFEYE	0.2	-	-	UI	
Effective Veye Level	VEYE	80	-	-	mV	
CMPI Clock	1UI		0.714		ns	

Note (1) CMPI EYE diagram must be in above spec. If your application is not in our spec., INX can not guarantee Display and function normal.

Note (2) Eye timing diagram



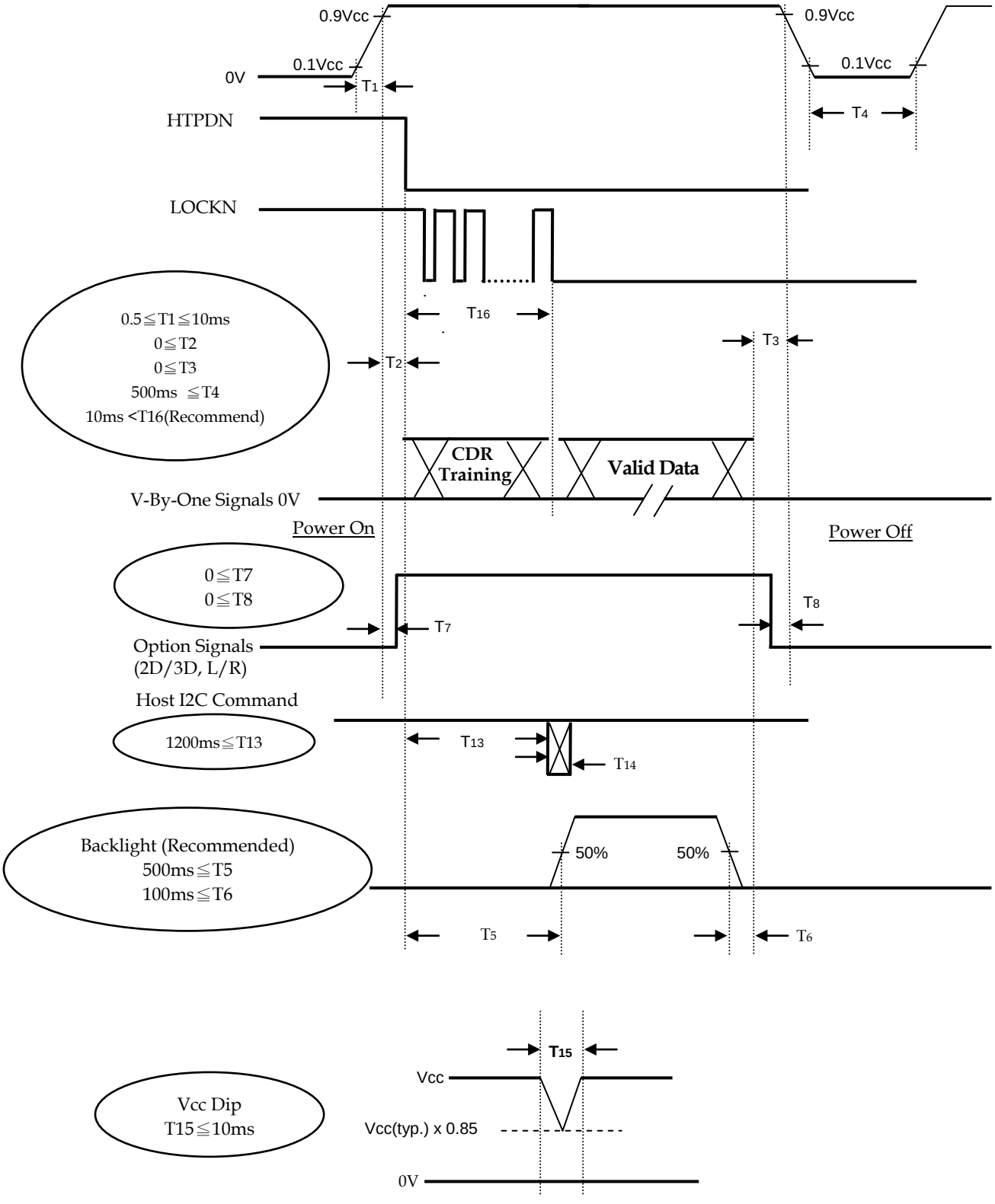
5.3 Byte Length and Color mapping of V-by-One HS

Packer input & Unpacker output		30bpp RGB (10bit)
Byte 0	D[0]	R[2]
	D[1]	R[3]
	D[2]	R[4]
	D[3]	R[5]
	D[4]	R[6]
	D[5]	R[7]
	D[6]	R[8]
	D[7]	R[9]
Byte 1	D[8]	G[2]
	D[9]	G[3]
	D[10]	G[4]
	D[11]	G[5]
	D[12]	G[6]
	D[13]	G[7]
	D[14]	G[8]
	D[15]	G[9]
Byte 2	D[16]	B[2]
	D[17]	B[3]
	D[18]	B[4]
	D[19]	B[5]
	D[20]	B[6]
	D[21]	B[7]
	D[22]	B[8]
	D[23]	B[9]
Byte 3	D[24]	X
	D[25]	X
	D[26]	B[0]
	D[27]	B[1]
	D[28]	G[0]
	D[29]	G[1]
	D[30]	R[0]
	D[31]	R[1]

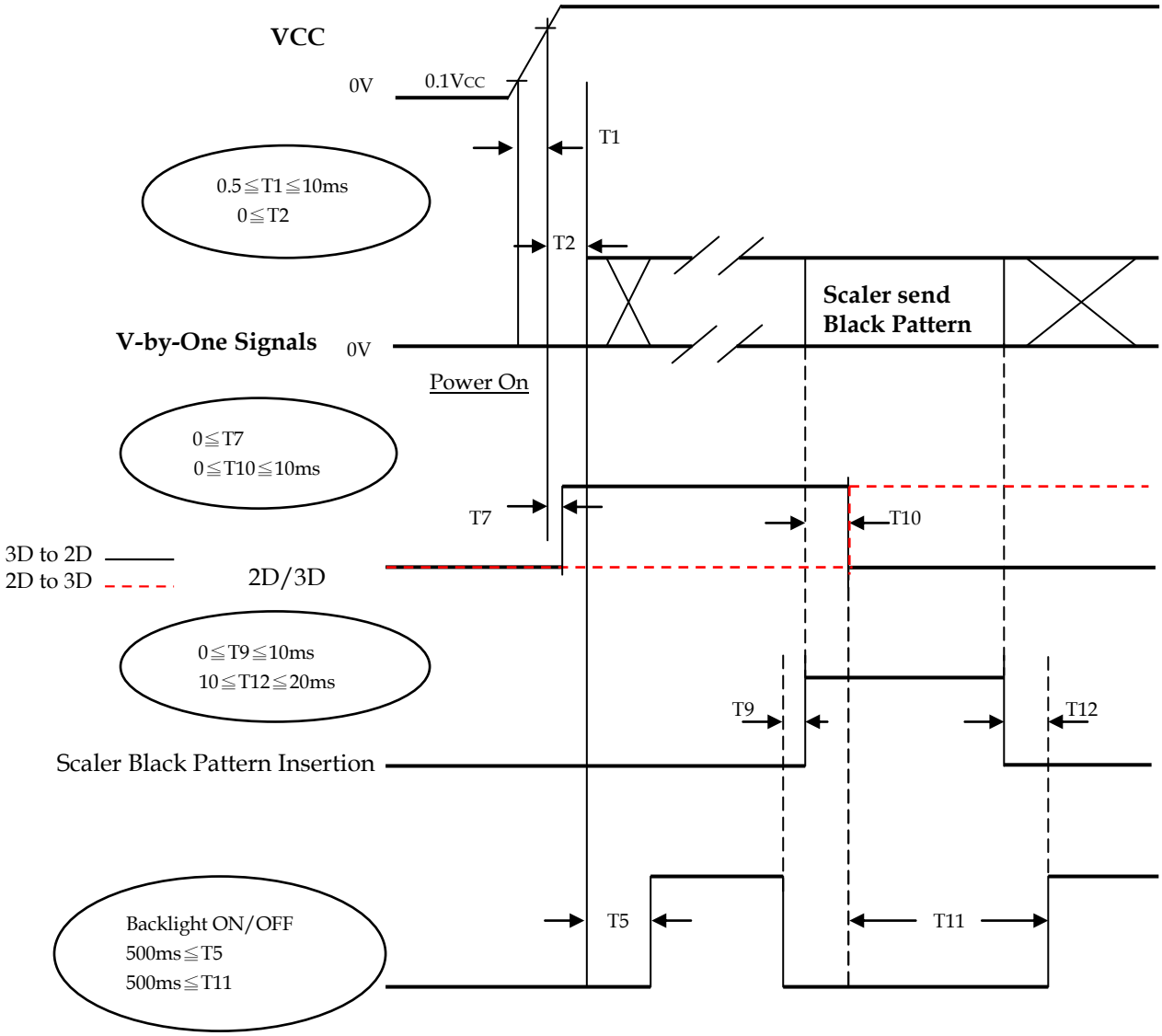
5.4 POWER ON/OFF SEQUENCE

(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.



5.5 2D/3D MODE CHANGE SIGNAL SEQUENCE WITHOUT VCC TURN OFF AND TURN ON



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

Note (2) Apply the LED 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 besides HTPDN and LOCKN . If T2<0, that maybe cause electrical overstress failure.

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

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) When 2D/3D mode is changed, TCON will insert black pattern internally. During black insertion, TCON would load required optical table and TCON parameter setting. The black insertion time should be longer than 650ms because TCON must recognize 2D or 3D format and set the correct parameter.

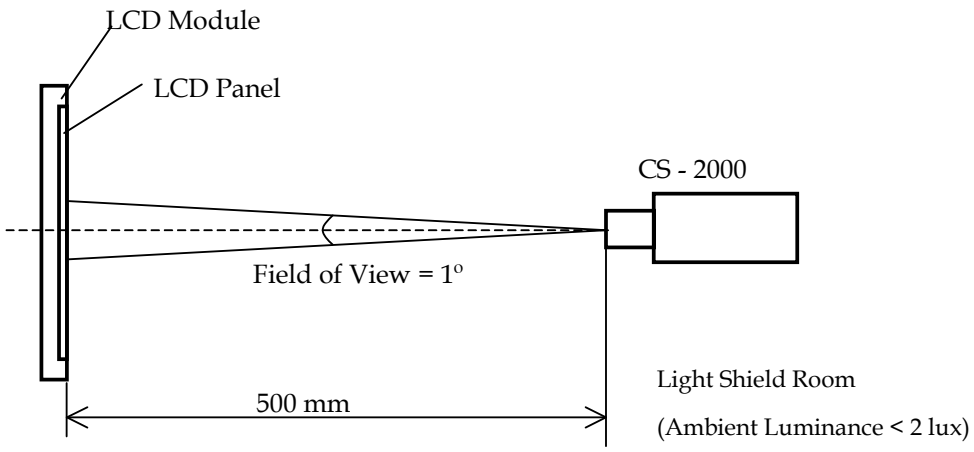
Note (7) Vcc must be decayed smoothly when power-off.

6. OPTICAL CHARACTERISTICS

6.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12V±1.2	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		

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



6.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. 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
Color Chromaticity	Red	Rcx	θ_x=0°, θ_Y =0° Viewing Angle at Normal Direction Standard light source "C"	Typ. -0.03	(0.669)	Typ. +0.03	-	(0)
		Rcy			(0.318)		-	
	Green	Gcx			(0.266)		-	
		Gcy			(0.617)		-	
	Blue	Bcx			(0.136)		-	
		Bcy			(0.095)		-	
	White	Wcx			(0.297)		-	
		Wcy			(0.346)		-	
Transmittance		T%	θ_x=0°, θ_Y =0° with INX module	4.32	4.8		%	(5)
Transmittance Variation		δT				1.3		(6)
Contrast Ratio		CR			5000	-	-	(1),(3)
Response Time		Gray to gray	θ_x=0°, θ_Y =0° with INX Module	-	6.5	13	ms	(1),(4)
Viewing Angle	Horizontal	θ_x+	CR≥20 With INX module	-	88	-	Deg.	(1),(2)
		θ_x-		-	88	-		
	Vertical	θ_Y+		-	88	-		
		θ_Y-		-	88	-		
Transmission direction of the up polarizer		Φ_{up-P}	-	-	90	-	Deg.	(7)

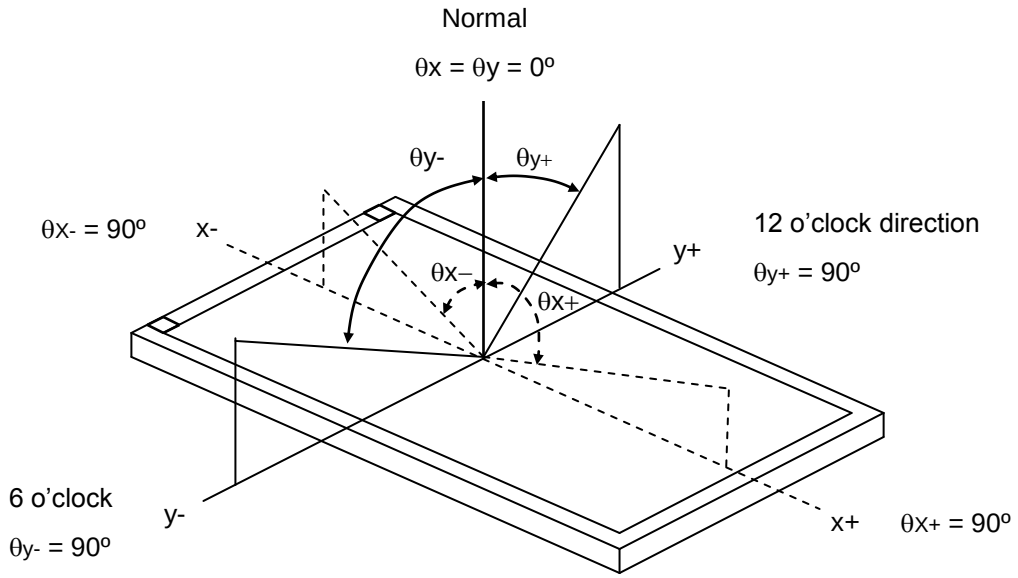
Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltage are based on suitable gamma voltages. The calculating method is as following:

1. Measure Module's and BLU's spectrum at center point. White and R,G,B are with signal input. BLU (for V850DK1-KD1) is supplied by INX.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C".

Note (1) Light source is the BLU which supplied by INX (V500HJ1-L01) and the cell driving voltage are based on suitable gamma voltages.

Note (2) Definition of Viewing Angle (θx, θy) :

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



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

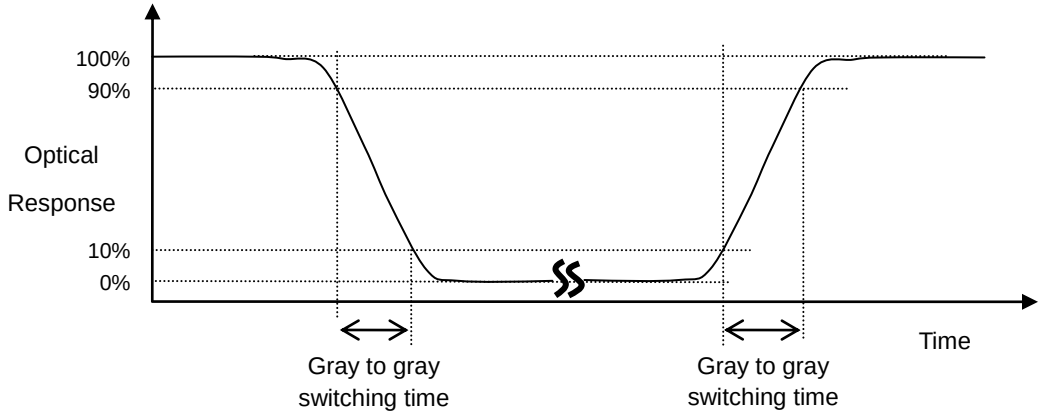
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L1023}}{\text{Surface Luminance of L0}}$$

L1023 : Luminance of gray level 1023

L0 : 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 (5).

Note (4) Definition of Gray-to-Gray Switching Time:



The driving signal means the signal of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023.

Gray to gray average time means the average switching time of gray level 0, 124, 252, 380, 508, 636, 764, 892 and 1023 to each other.

Note (5) Definition of Transmittance (T%) :

Measure the transmittance at 5 points.

Light source is the BLU which contains three diffuser sheets and the cell driving voltage are based on suitable gamma voltages.

Transmittance (T%) = $\text{Average}\left[T(1), T(2), T(3), T(4), T(5)\right]$

The transmittance of each point can be calculated by the following expression.

$$T(X) = \frac{L255(X)\text{ of LCD module}}{\text{Luminance}(X)\text{ of BLU}} \times 100\%$$

L255: Luminance of gray level 255

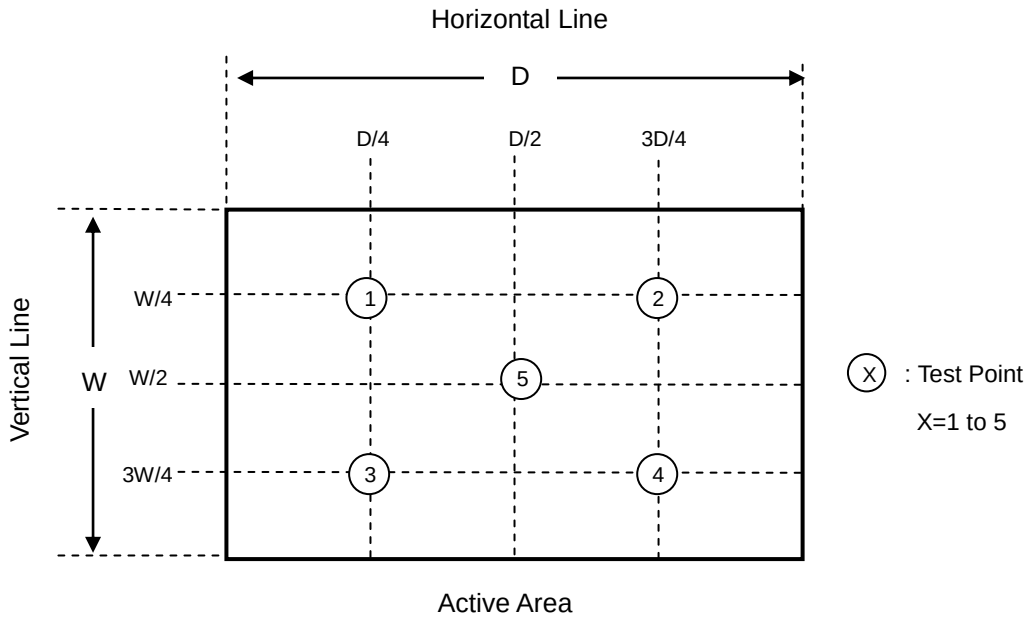
T(X) is corresponding to the point X1~X5 at the figure in Note (6).

Note (6) Definition of Transmittance Variation (δT) :

Measure the transmittance at 5 points.

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

T(X) is calculated as Note(5).



7. PRECAUTIONS

7.1 ASSEMBLY AND HANDLING PRECAUTIONS

[1] Do not apply improper or unbalanced force such as bending or twisting to open cells during assembly.

[2] It is recommended to assemble or to install an open cell into a customer's product in clean working areas. The dust and oil may cause electrical short to an open cell or worsen polarizers on an open cell.

[3] Do not apply pressure or impulse to an open cell to prevent the damage.

[4] Always follow the correct power-on sequence when an open cell is assembled and turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

[5] Do not design sharp-pointed structure / parting line / tooling gate on the plastic part of a COF (Chip on film), because the burr will scrape the COF.

[6] If COF would be bended in assemble process, do not place IC on the bending corner.

[7] The gap between COF IC and any structure of BLU must be bigger than 2 mm. This can prevent the damage of COF IC.

[8] The bezel opening must have no burr and be smooth to prevent the surface of an open cell scraped.

[9] The bezel of a module or a TV set can not contact with force on the surface of an open cell. It might cause light leakage or scrape.

[10] In the case of no FFC or FPC attached with open cells, customers can refer the FFC / FPC drawing and buy them by self.

[11] It is important to keep enough clearance between customers' front bezel/backlight and an open cell. Without enough clearance, the unexpected force during module assembly procedure may damage an open cell.

[12] Do not plug in or unplug an I/F (interface) connector while an assembled open cell is in operation.

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

[14] Moisture can easily penetrate into an open cell and may cause the damage during operation.

[15] When storing open cells as spares for a long time, the following precaution is necessary.

[15.1] Do not leave open cells in high temperature and high humidity for a long time. It is highly recommended to store open cells in the temperature range from 0 to 35℃ at normal humidity without condensation.

[15.2] Open cells shall be stored in dark place. Do not store open cells in direct sunlight or fluorescent light environment.

[16] When ambient temperature is lower than 10°C, the display quality might be reduced.

[17] Unpacking (Hard Box) in order to prevent open cells broken:

[17.1] Moving hard boxes by one operator may cause hard boxes fell down and open cells broken by abnormal methods. Four operators carry one hard box with their two hands. Do handle hard boxes carefully, such as avoiding impact, putting down, and piling up gently.

[17.2] To prevent hard boxes sliding from carts and falling down, hard boxes should be placed on a surface with resistance.

[17.3] To prevent an open cell broken or a COF damaged in a hard box, please follow the instructions below:

[17.3.1] Do not peel a polarizer protection film of an open cell off in a hard box.

[17.3.2] Do not install FFC or V-by-One cables of an open cell in a hard box.

[17.3.3] Do not press the surface of an open cell in a hard box.

[17.3.4] Do not pull X-board when an open cell placed in a hard box.

[18] Handling – In order to prevent open cells, COFs , and components damaged:

[18.1] The forced displacement between open cells and X-board may cause a COF damaged. Use a fixture tool for handling an open cell to avoid X-board vibrating and interfering with other components on a PCBA & a COF.

[18.2] To prevent open cells and COFs damaged by taking out from hard boxes, using vacuum jigs to take out open cells horizontally is recommended.

[18.3] Improper installation procedure may cause COFs of an open cell over bent which causes damages. As installing an open cell on a backlight or a test jig, place the bottom side of the open cell first on the backlight or the test jig and make sure no interference before fitting the open cell into the backlight/the test jig.

[18.4] Handle open cells one by one.

[19] Avoid any metal or conductive material to contact PCB components, because it could cause electrical damage or defect.

7.2 SAFETY PRECAUTIONS

[1] If the liquid crystal material leaks from the open cell, 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.

[2] After the end of life, open cells are not harmful in case of normal operation and storage.

8. DEFINITION OF LABELS

8.1 OPEN CELL LABEL

The barcode nameplate is pasted on each open cell as illustration for INX internal contro

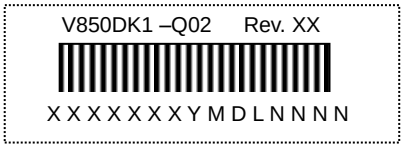
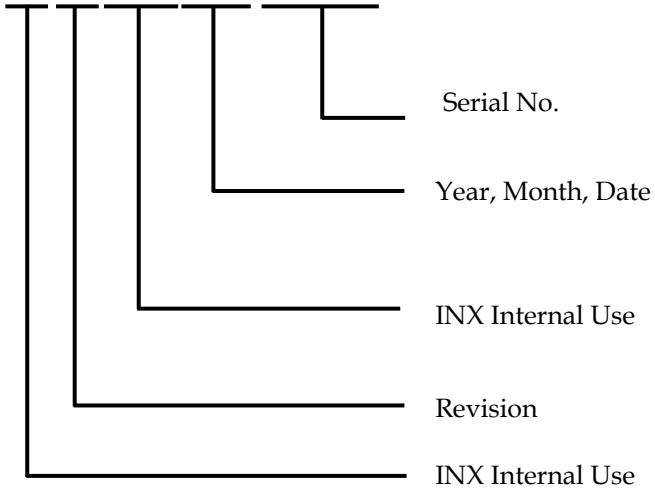


Figure.9-1 Serial No. Label on SPWB

Model Name : V850DK1-Q02

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: 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

Serial No.: Manufacturing sequence of product

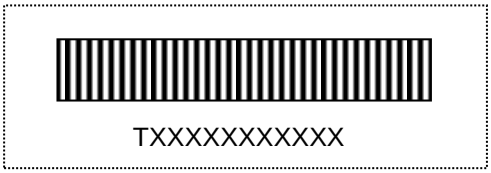
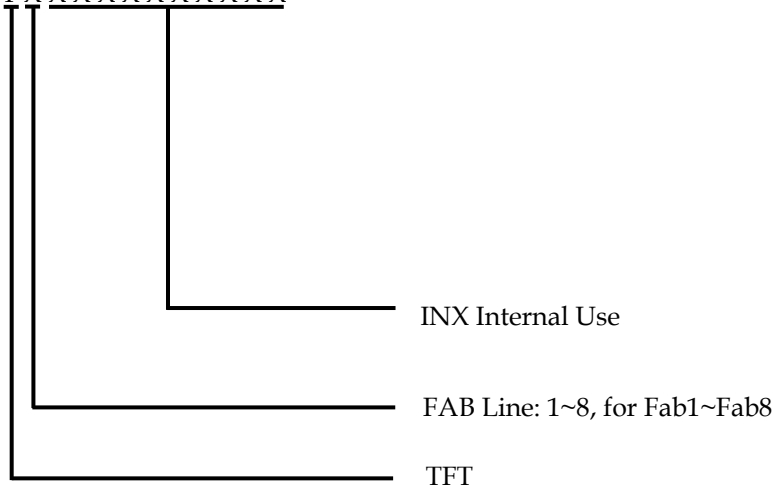


Figure.9-2 Panel ID Label on Cell

Panel ID Label includes the information as below:

Panel ID: T X X X X X X X X X X



9. PACKAGING

9.1 PACKAGING SPECIFICATIONS

(1) 5 LCD TV Panels / 1 Box

(2) Box dimensions : 2150 (L) X 1360 (W) X 110 (H)mm

(3) Weight : approximately 50 Kg (5 panels per box)

(4) 45 LCD TV Panels / 1 Group

(5) Group dimensions : 2200 (L) X 1500 (W) X1160 (H)mm

(6) Weight : approximately 515 Kg / 1 Group

(7) Without the outer carton, Boxes stack under the package architecture.

(8) Please fill up the container to avoid any cargo be damaged.

(9) INX recommend to follow the packing method as described in 9.2

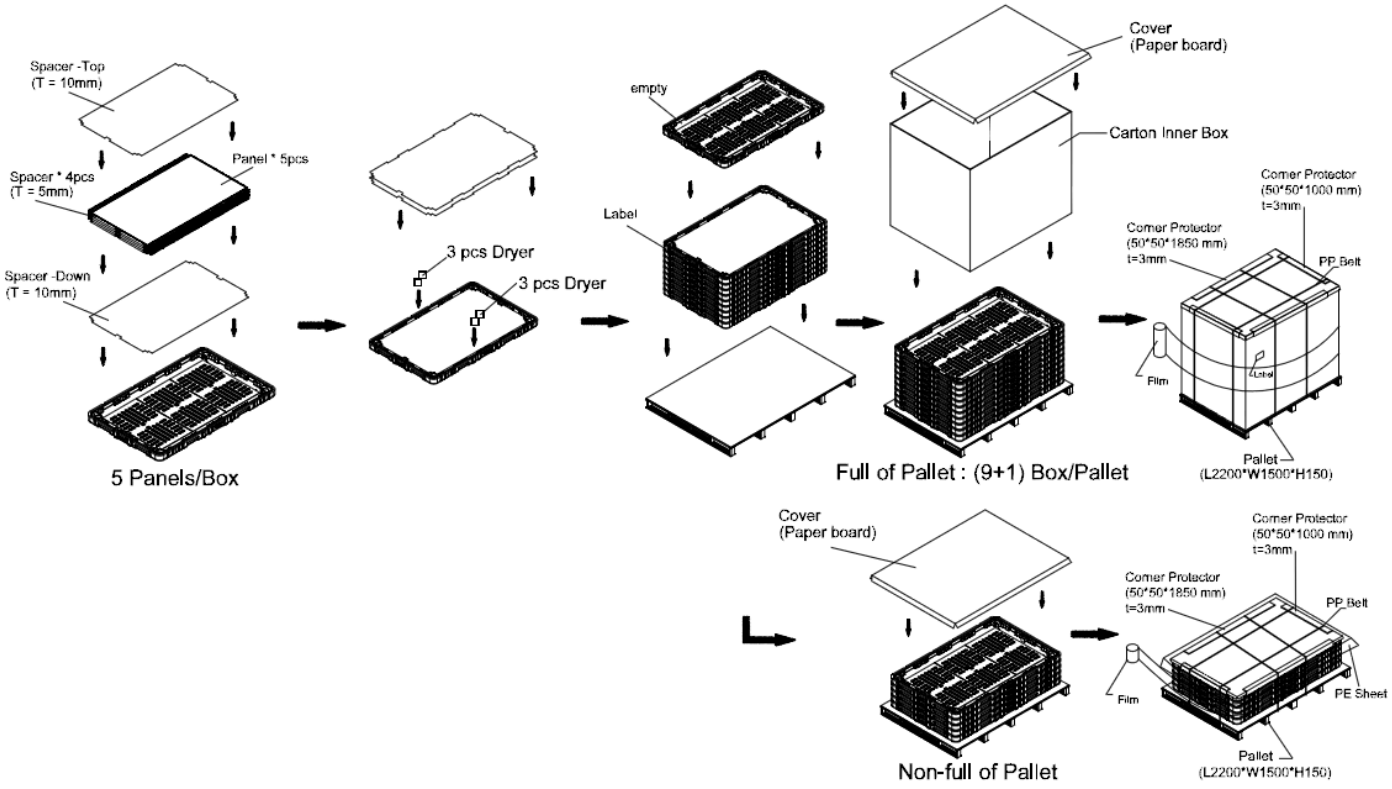
(10) When transferring in warehouse or factory, the arm length of electric forklift or hand pallet truck must be longer than the pallet length.

(11) After un-packing, one box is needed to be carried by four persons which is to prevent box bent or fell down.

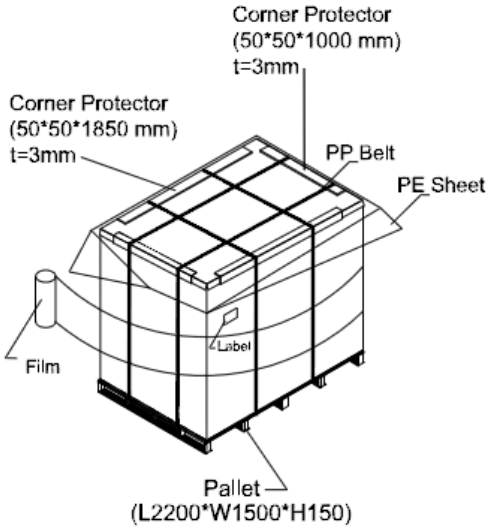
(12) The surface area of the worktable or carts should be greater than box size.

9.2 PACKAGING METHOD

Packaging method is shown in following figures.

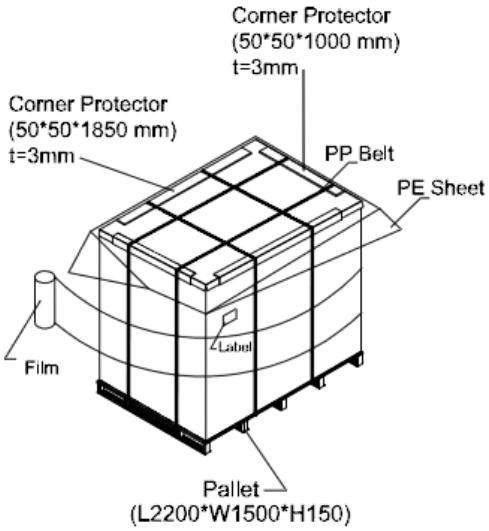


Sea / Land Transportation



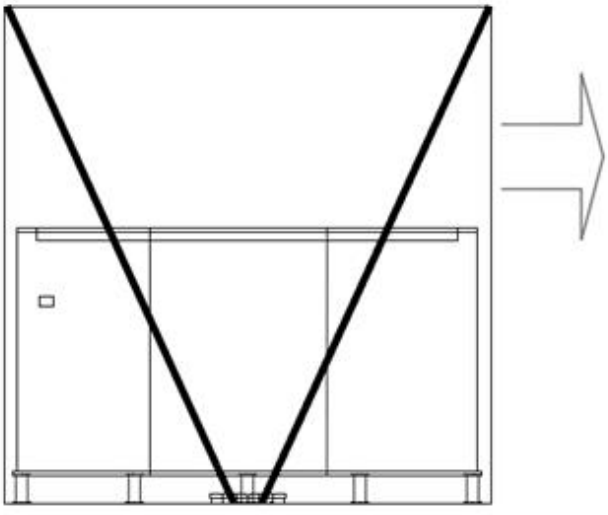
(9+1) Box/Pallet

Air Transportation

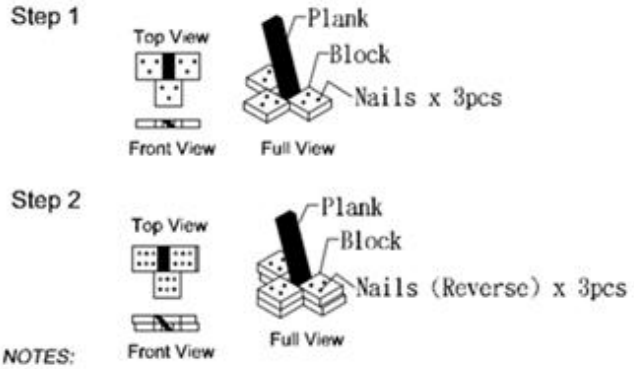


(9+1) Box/Pallet

The Fixed Way of Block and Plank in the Container Tail



(Front View)

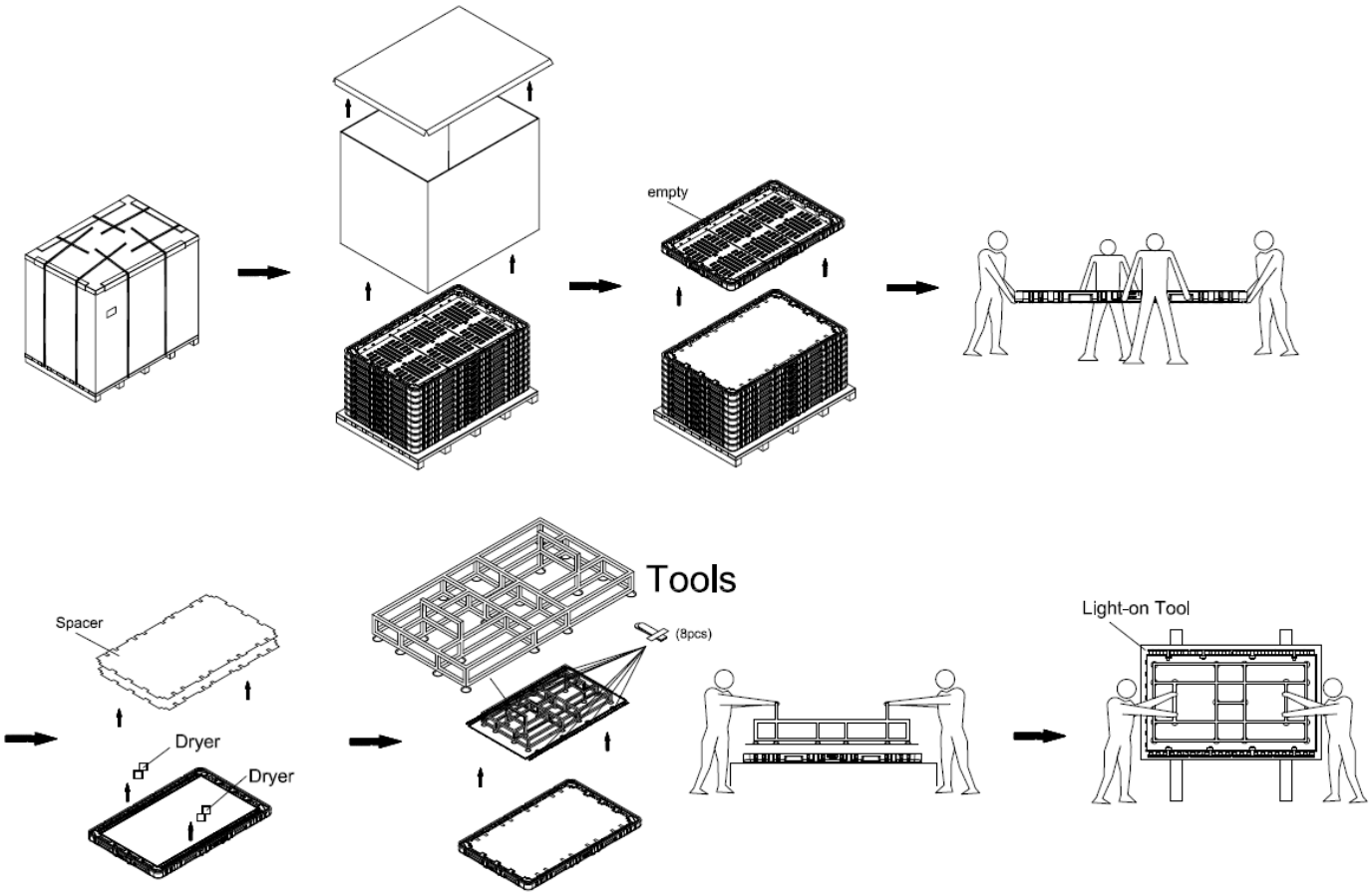


NOTES:

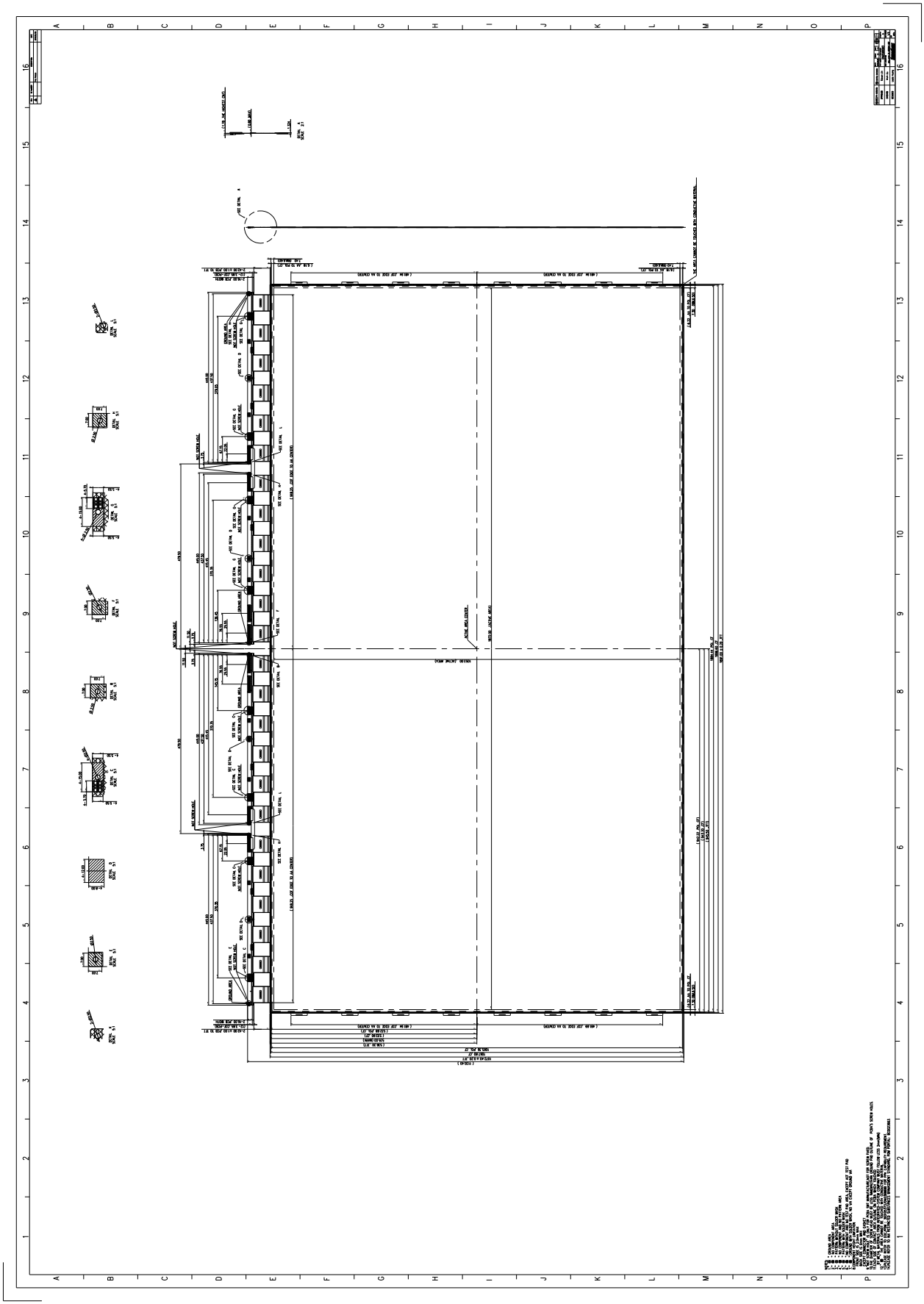
1. *Block:*
   - *(1) Wood : L=150mm · W=70mm · H=45mm (With Wood Pallet)*
   - *(2) Paper : L=100mm · W=100mm · H=30mm (With Plywood Pallet)*
2. *Plank:*
   - *(1) Wood (With Wood Pallet)*
     - *HQ Container : L=2840mm · W=88mm · H=45mm*
     - *GP Container : L=2575mm · W=88mm · H=45mm*
     - *Common : L=3130mm · W=88mm · H=45mm*
   - *(2) Plywood (With Plywood Pallet)*
     - *HQ Container : L=2860mm · W=90mm · H=45mm*
     - *GP Container : L=2480mm · W=90mm · H=45mm*
     - *Common : L=3130mm · W=90mm · H=45mm*
3. *Nail : Coil Nail (FC-70) · Length 67mm*
4. *The Dimension Tolerance of Block, Plank and Nail is ±5%*
5. *The plank need to close the sidewall of the container and container flooring to fixed*

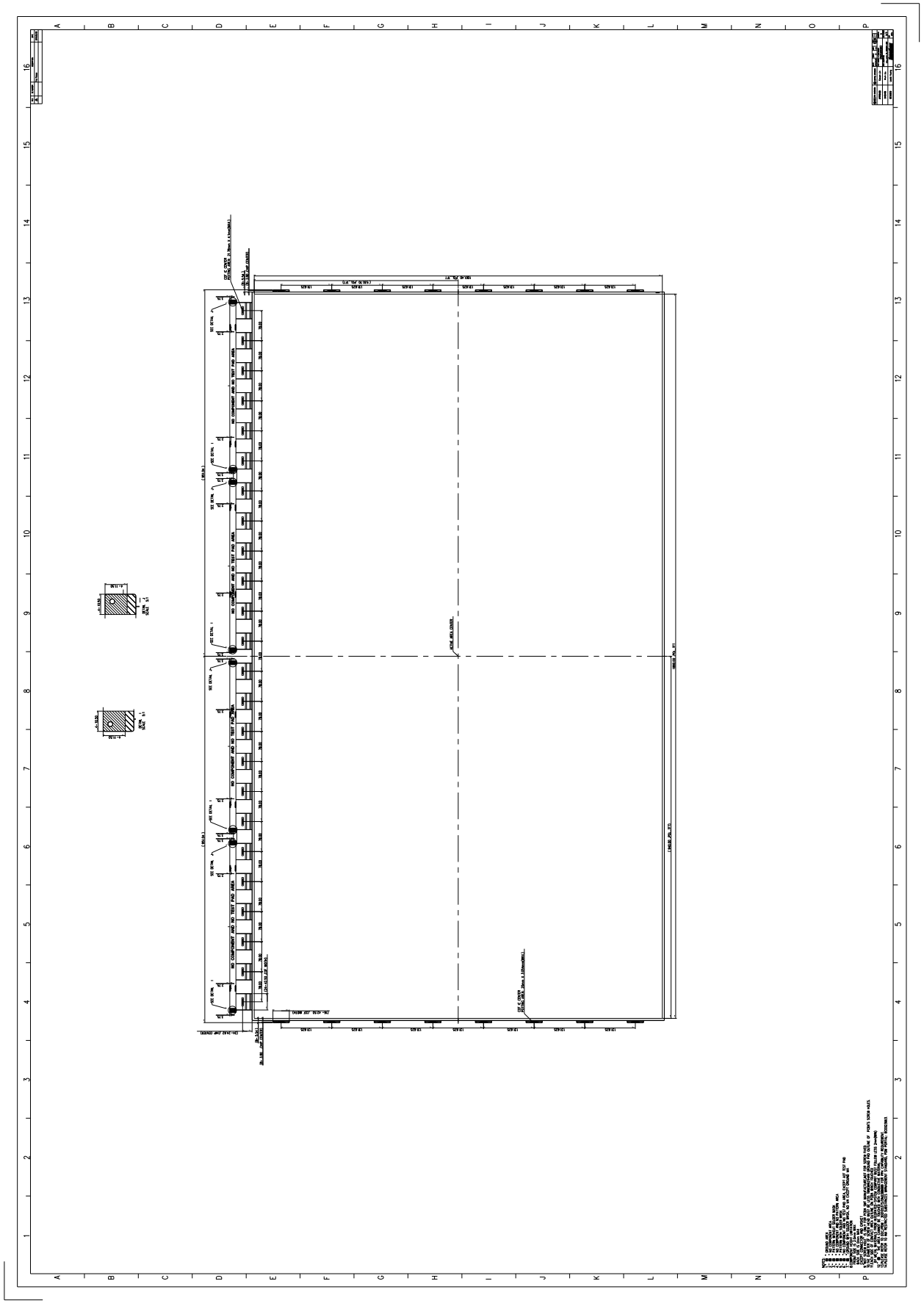
9.3 UN-PACKAGING METHOD

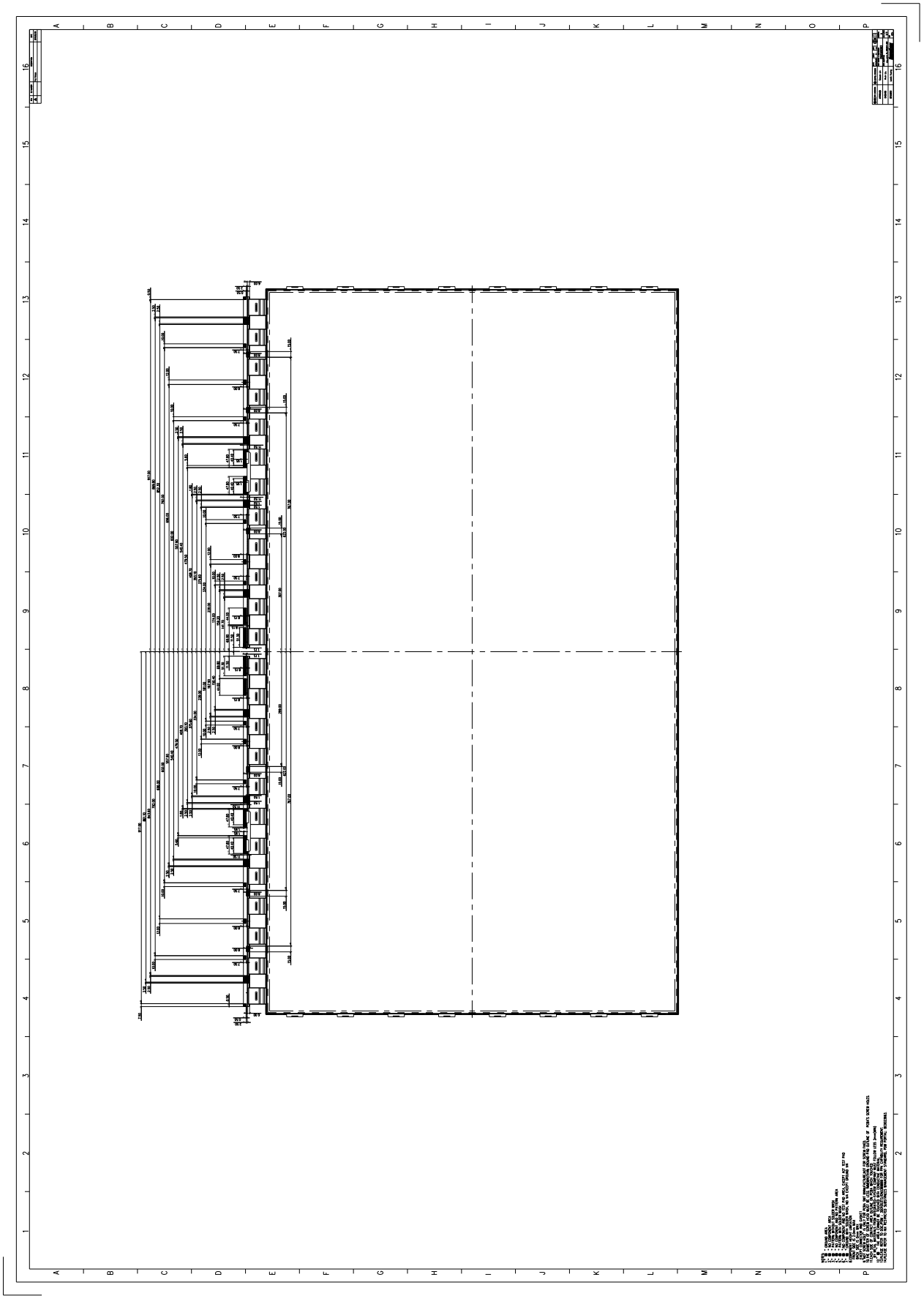
Un-packaging method is shown as following figures.



10. MECHANICAL CHARACTERISTIC







Appendix A

A.2 I2C timing

Symbol	Parameter	Min.	Max.	Unit
t_{SU-STA}	Start setup time	250	-	ns
t_{HD-STA}	Start hold time	250	-	ns
t_{SU-DAT}	Data setup time	80	-	ns
t_{HD-DAT}	Data hold time	0	-	ns
t_{SU-STO}	Stop setup time	250	-	ns
t_{BUF}	Time between Stop condition and next Start condition	500	-	ns