□ Tentative Specification
□ Preliminary Specification
■ Approval Specification

MODEL NO.: V500DJ6

SUFFIX: QE1

Revision :T3
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 HH Huang	WEITING.HSU	ERIS.KO

CONTENTS

REVISION HISTORY

Version	Date	Page(New)	Section	Description
2.0	2016/10/25	All	All	The Approval spec was first issued

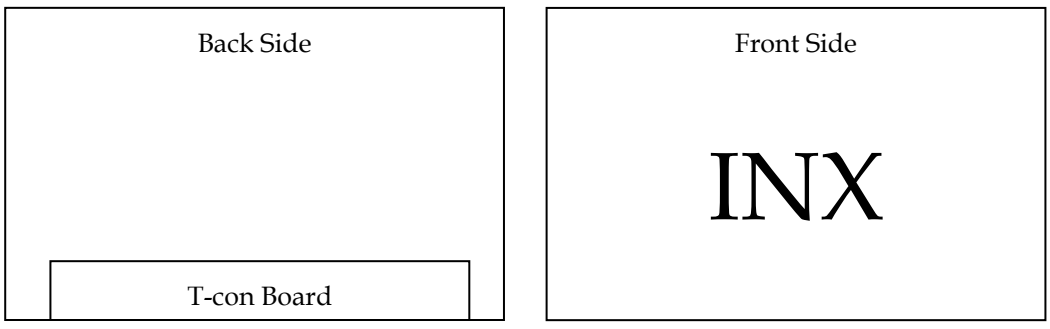
1. GENERAL DESCRIPTION

1.1 OVERVIEW

V500DJ6-QE1 is a 50" TFT Liquid Crystal Display product with driver ICs and 8Lanes V-by-One interface.. This product supports 3840 x 2160 Quad Full HDTV format and can display 1.07G colors (8-bit+FRC). The backlight unit is not built in.

1.2 FEATURES

CHARACTERISTICS ITEMS	SPECIFICATIONS
Screen Diagonal [in]	50
Pixels [lines]	3840 × 2160
Active Area [mm]	1095.84(H) × 616.41(V) (50" diagonal)
Sub-Pixel Pitch [mm]	0.0951(H) × 0.2854(V)
Pixel Arrangement	RGB Vertical Stripe
Weight [g]	2060 Typ. (g)
Physical Size [mm]	1106.84× 669.46× 1.319Typ.
Display Mode	Transmissive Mode / Normallly Black
Contrast Ratio	Typ.5000:1 (Typical value measure by INX's Module)
Glass thickness (Array / CF) [mm]	0.5 / 0.5
Viewing Angle (CR>10)	Typ. +89/-89(H), +89/-89(V) (CR≧10) (Typical value measured by INX's module)
Color Chromaticity	R = (0.661,0.328) G = (0.283,0.586) B = (0.138,0.102) W= (0.316,0.350) * Please refer to "color chromaticity" in 7.2
Cell Transparency [%]	5.6% Typ. Please refer to "Transmittance" in 7.2
Polarizer Surface Treatment	AG (Haze~1%) Hardness: 3H
Rotation Function	Unachievable
Display Orientation	Signal input with "INX"
RoHs Compliance	

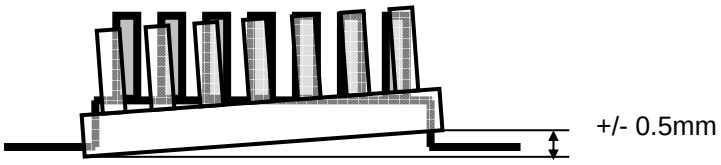


1.3 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	2060	-	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	TST	-20	+60	°C	(1), (3)
Operating Ambient Temperature	TOP	0	50	°C	(1), (2), (3)

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

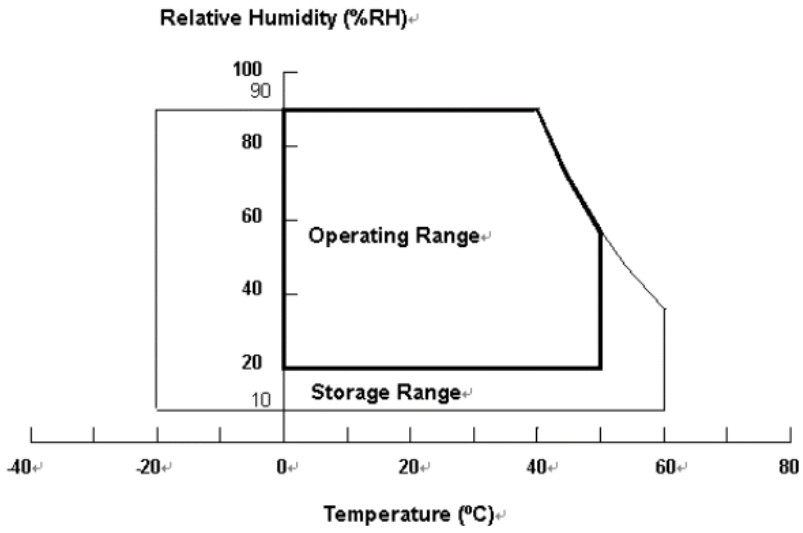
(a) 90 %RH Max. (Ta ≦ 40 °C).

(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)

Recommended Storage Condition: With shipping package.

Recommended Storage temperature range: 25±5 ℃

Recommended Storage humidity range: 50±10%RH

Recommended Shelf life: a month

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 Temperature	---	---	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.

Note (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 OPEN CELL

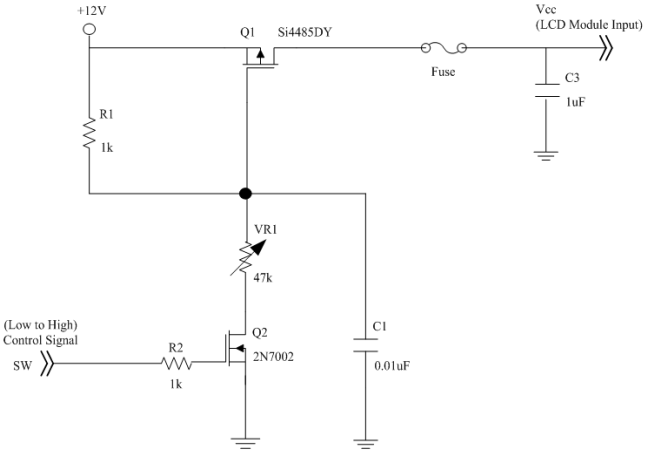
(Ta = 25 ± 2 °C)

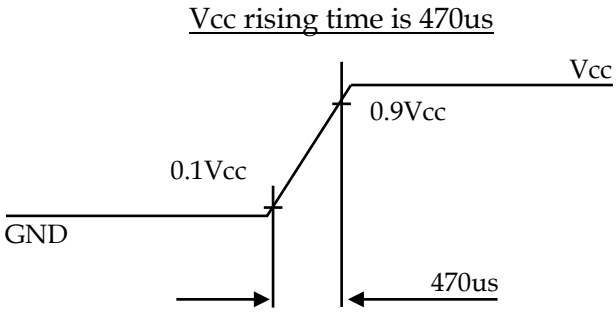
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	13.2	V	(1)
Rush Current		I_{RUSH}	—	—	2.94	A	(2)
Power consumption	White Pattern	P_T	—	10.46	11.51	W	(3)
	Black Pattern	P_T	—	9.12	10.03		
	Horizontal Stripe	P_T	—	20.62	22.68		
Power Supply Current	White Pattern	—	—	0.91	1.09	A	
	Black Pattern	—	—	0.78	0.95		
	Horizontal Stripe	—	—	1.79	2.16		
V-by-One HS	Differential Input High Threshold Voltage	V_{LVTH}	—	—	+50	mV	
	Differential Input Low Threshold Voltage	V_{LVTL}	-50	—	—	mV	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	—	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	—	0.7	V	

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

The ripple voltage should be controlled under 10% of Vcc (Typ.).

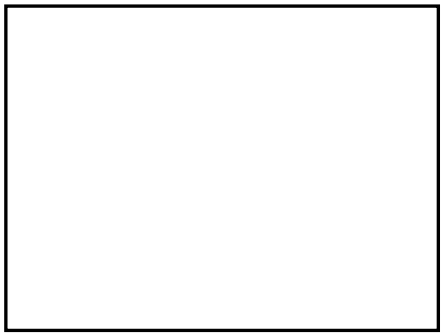
Note (2) Measurement condition :





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

a. White Pattern

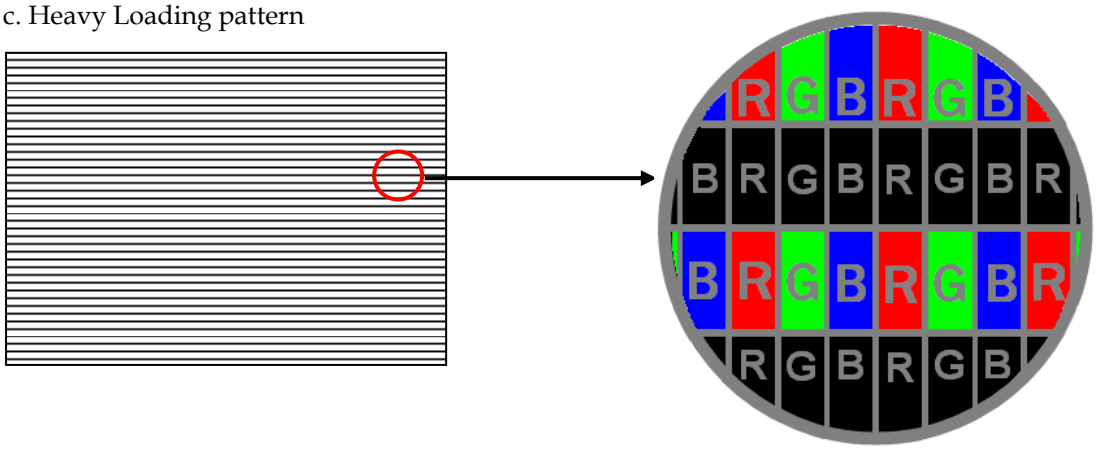


Active Area

b. Black Pattern

Active Area

c. Heavy Loading pattern



4. INPUT TERMINAL PIN ASSIGNMENT

4.1 TFT LCD OPEN CELL INPUT

CNV1 Connector Pin Assignment [187059-51221(P-TWO), WF23-402-5133(FCN)]

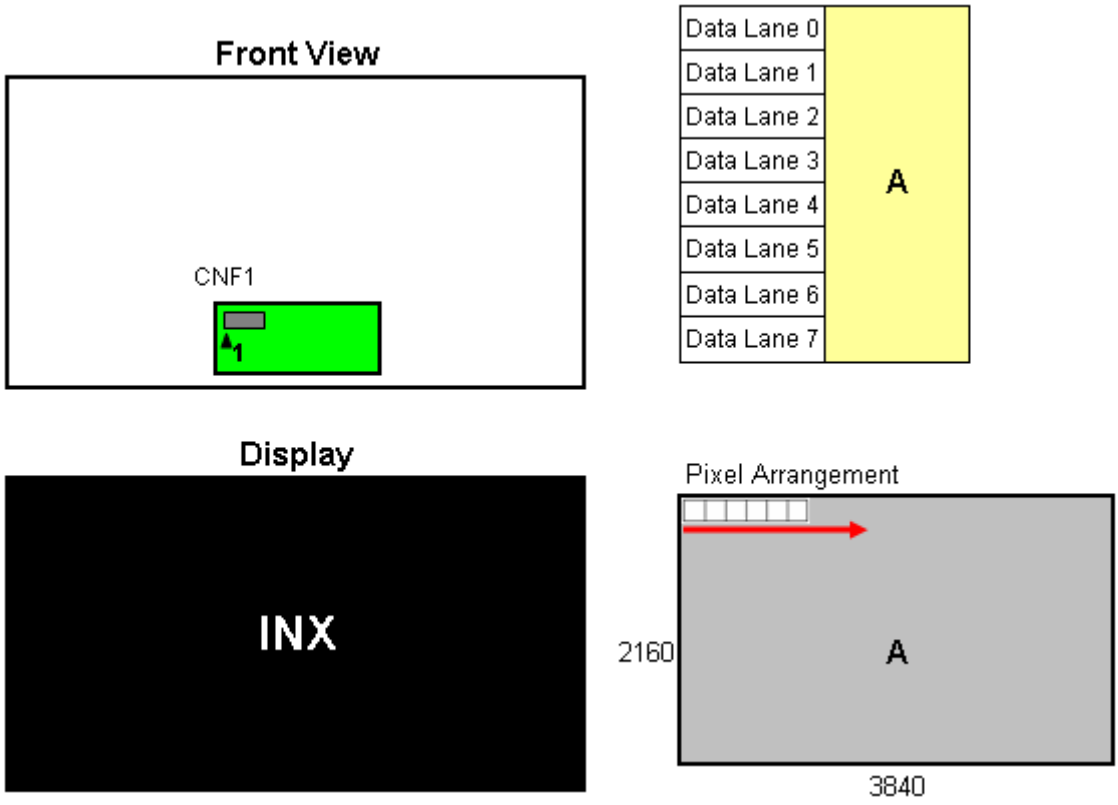
Matting connector : [FI-RE51HL (JAE)]

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	Vin	Power input (+12V)	
8	Vin	Power input (+12V)	
9	N.C.	No Connection	(4)
10	GND	Ground	
11	GND	Ground	
12	GND	Ground	
13	GND	Ground	
14	GND	Ground	
15	N.C.	No Connection	(4)
16	N.C.	No Connection	(4)
17	N.C	No Connection	(4)
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	VSYNC	VSYNC output (for Local Dimming)	
22	N.C.	No Connection	(4)
23	N.C.	No Connection	(4)
24	N.C.	No Connection	(4)
25	HTPDN	Hot plug detect output, Open drain.	
26	LOCKN	Lock detect output, Open drain.	
27	GND	Ground	
28	RX0N	1ST Pixel Negative V-by-One differential data input in area A. Lane 0	(1)
29	RX0P	1ST Pixel Positive V-by-One differential data input in area A. Lane 0	
30	GND	Ground	
31	RX1N	2ND Pixel Negative V-by-One differential data input in area A. Lane 1	(1)
32	RX1P	2ND Pixel Positive V-by-One differential data input in area A. Lane 1	
33	GND	Ground	

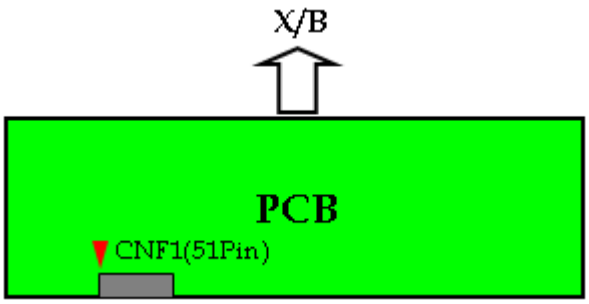
34	RX2N	3RD Pixel Negative V-by-One differential data input in area A. Lane 2	(1)
35	RX2P	3RD Pixel Positive V-by-One differential data input in area A. Lane 2	
36	GND	Ground	
37	RX3N	4TH Pixel Negative V-by-One differential data input in area A. Lane 3	(1)
38	RX3P	4TH Pixel Positive V-by-One differential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

Note (1) V-by-One^{R} HS Data Mapping

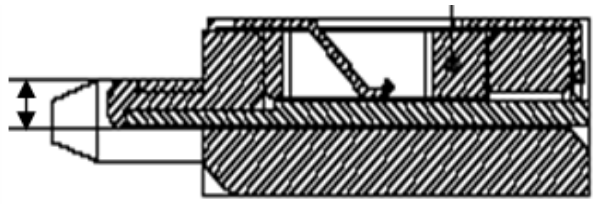
Area	Lane	Data Stream
A	Lane 0	1, 9, 17, ..., 3825, 3833
	Lane 1	2, 10, 18, ..., 3826, 3834
	Lane 2	3, 11, 19, ..., 3827, 3835
	Lane 3	4, 12, 20, ..., 3828, 3836
	Lane 4	5, 13, 21, ...,3829, 3837
	Lane 5	6, 14, 22, ..., 3830, 3838
	Lane 6	7, 15, 23, ..., 3831, 3839
	Lane7	8, 16, 24, ..., 3832, 3840



Note (2) V-by-One HS connector pin order defined as follows



Note (3) V-by-One connector mating dimension range request is 0.93mm~1.0mm as below



Note (4) Reserved for internal use. Please leave it open.

Note (5) The detail setting such as I2C command or timing requirement in QFHD is specified in INX application note. It's important and necessary to follow the specification either in product SPEC or application note, otherwise it may lead to abnormal or no display. INX application note would be provided by INX in the design-in stage.

Note (6) Side-view enhanced (ELCS) function is controlled by I2C command in INX application note

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
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	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

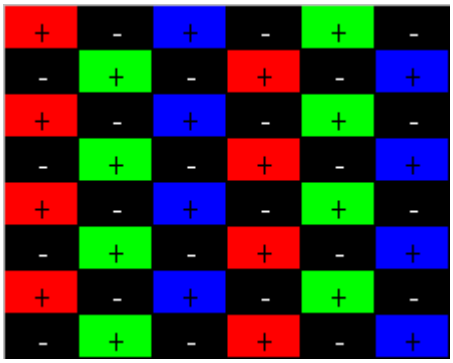
Note (1) 0: Low Level Voltage，1: High Level Voltage

4.3 FLICKER (Vcom) ADJUSTMENT

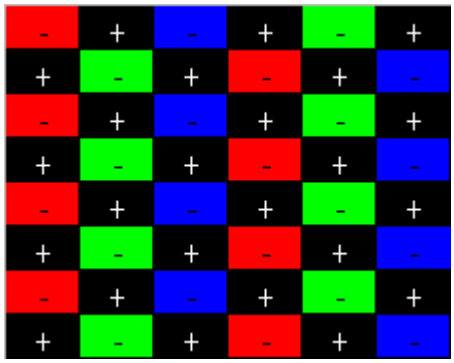
(1) Adjustment Pattern :

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

Frame N



Frame N+1



(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 °C)

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
Frequency	Data Clock	1/Tc	69	74.25	79	MHZ	(1)
V-by-One Receiver	Intra-Pair skew		-0.3	—	0.3	UI	(2)
	Inter-pair skew		-5	—	5	UI	(3)
	Spread spectrum modulation range	F_{clkin_mod}	1/Tc-0.5%	—	1/Tc+0.5%	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}	—	—	30	KHz	

5.1.1 Timing spec for QFHD Frame Rate = 50Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame rate	2D mode		Fr	49	50	51	Hz	(5),(6)
Vertical Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Tv	2200	2700	2790	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	40	540	630	Th	
Horizontal Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Th	530	550	590	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	70	110	Tc	

5.1.2 Timing spec for QFHD Frame Rate = 60Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	59	60	61	Hz	(5),(6)
Vertical Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Tv	2230	2250	2350	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	70	90	190	Th	
Horizontal Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Th	530	550	600	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	70	120	Tc	

5.1.3 Input Timing spec for QFHD, Frame Rate = 24Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	23.7	24	24.3	Hz	(5),(6)
Vertical Active Display Term (4 Lane, 3840X2160 Active Area)	2D Mode	Total	Tv	2208	2750	3200	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	48	590	1040	Th	
Horizontal Active Display Term (4 Lane, 3840X2160 Active Area)		Total	Th	1060	1125	1180	Tc	Th=Thd+Thb
		Display	Thd	960			Tc	
		Blank	Thb	100	165	220	Tc	

5.1.4 Input Timing spec for QFHD, Frame Rate = 30Hz

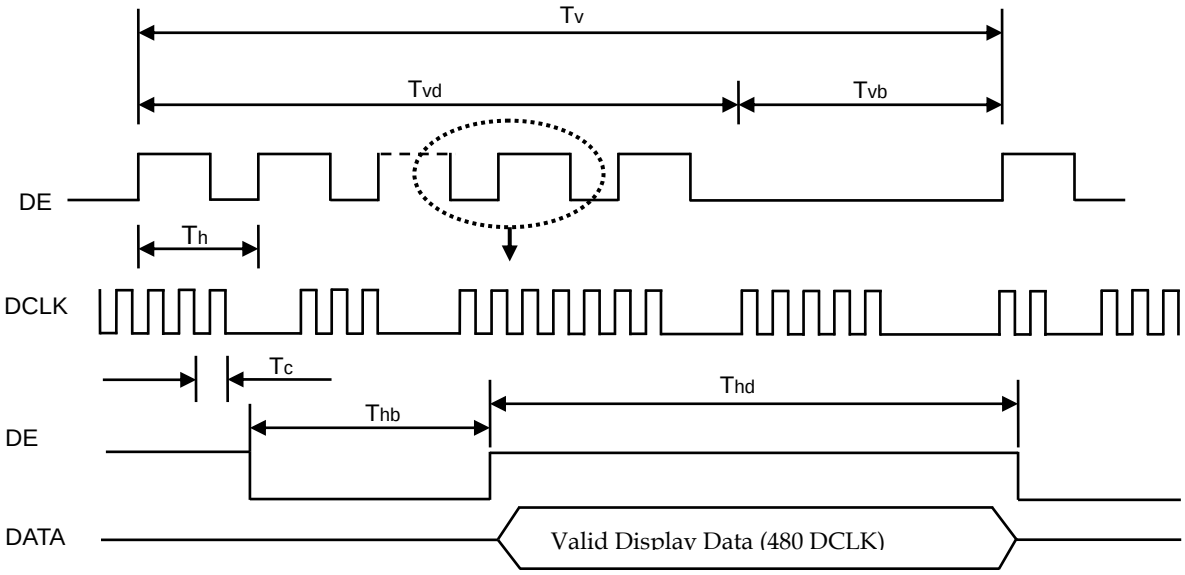
Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	29.5	30	30.5	Hz	(5),(6)
Vertical Active Display Term (4 Lane, 3840X2160 Active Area)	2D Mode	Total	Tv	2208	2250	2450	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	48	90	290	Th	
Horizontal Active Display Term (4 Lane,3840X2160 Active Area)	2D Mode	Total	Th	1060	1100	1180	Tc	Th=Thd+Thb
		Display	Thd	960			Tc	
		Blank	Thb	100	140	220	Tc	

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

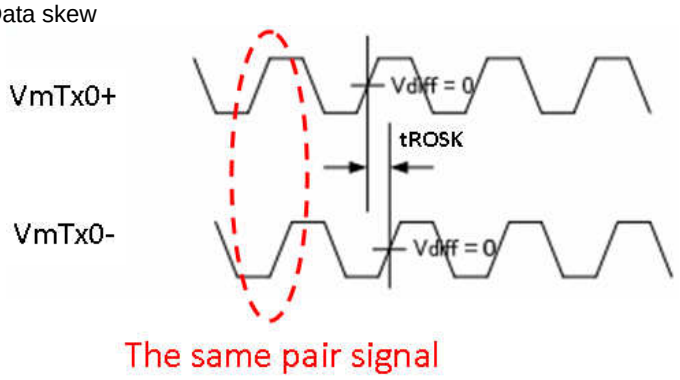
Fclkin(max) ≧ Fr × Tv × Th

Fr × Tv × Th ≧ Fclkin (min)

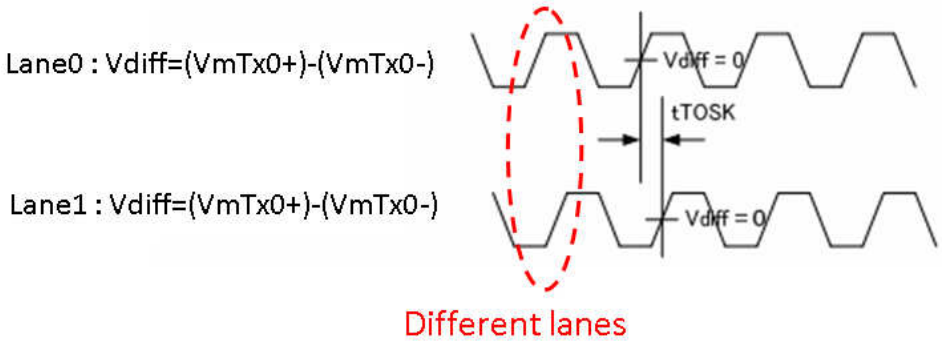
INPUT SIGNAL TIMING DIAGRAM



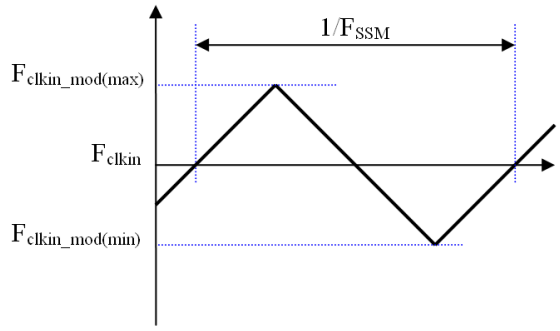
Note (2) Intra-pair Data skew



Note (3) V-by-One HS Inter-pair skew.

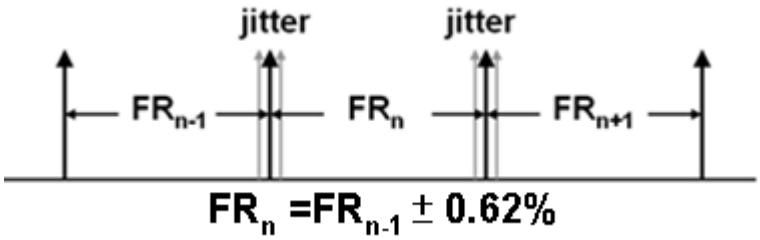


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The frame-to-frame jitter of the input frame rate is defined as the above figures. FRn = FRn-1 ± 0.62%.

Note (6) The setup of the frame rate jitter > 0.62% may result in incorrect timing mode and panel cosmetic symptom..



5.2 V by One Input Signal Timing Diagram

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

PLL bandwidth : 8M

Damping factor : 0.707

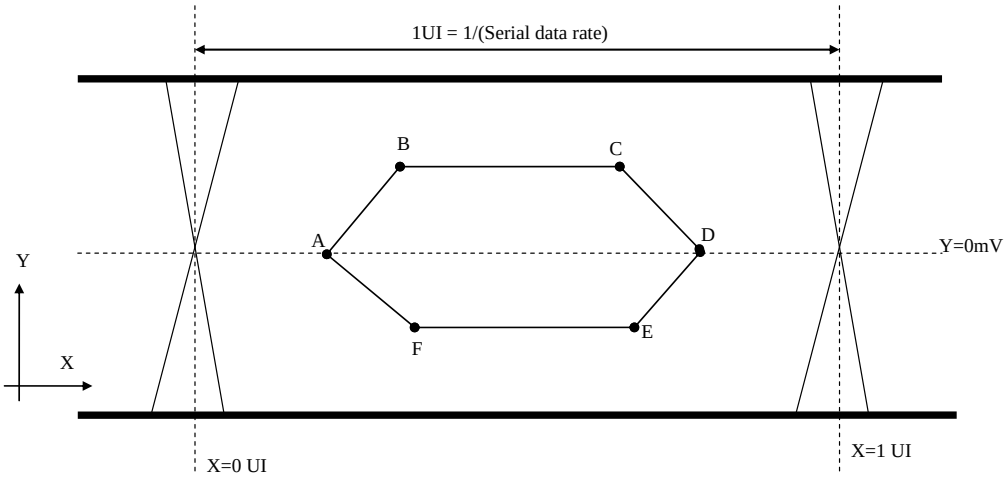


Table 1 Eye Mask Specification

	X [UI]	Y [mV]	Note
A	0.25	0	(1)
B	0.3	50	(1)
C	0.7	50	(1)
D	0.75	0	(1)
E	0.7	-50	(1)
F	0.3	-50	(1)

Note (1) Input levels of V-by-One HS signals are comes from "V-by-One HS Stander Ver.1.4"

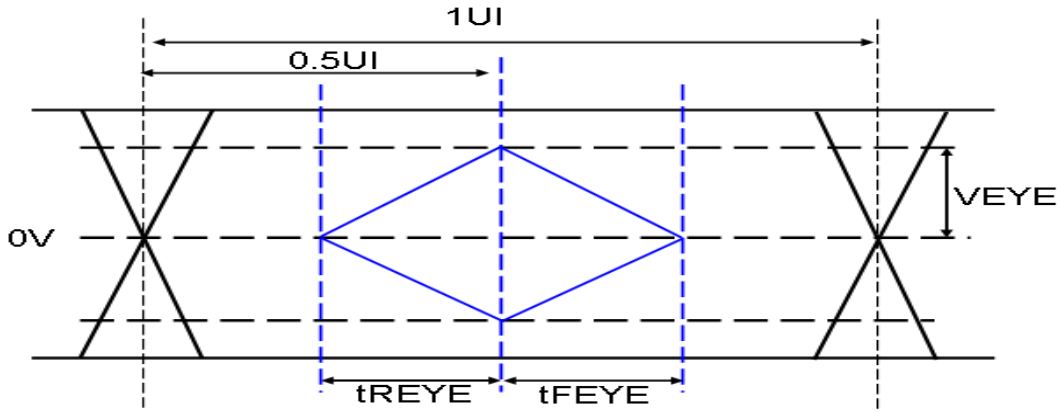
5.2.2 CMPI Signal Timing Diagram

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		0.703		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



Note (3) Measure point: Please directly contact with Account FAE for Measure CMPI signal method

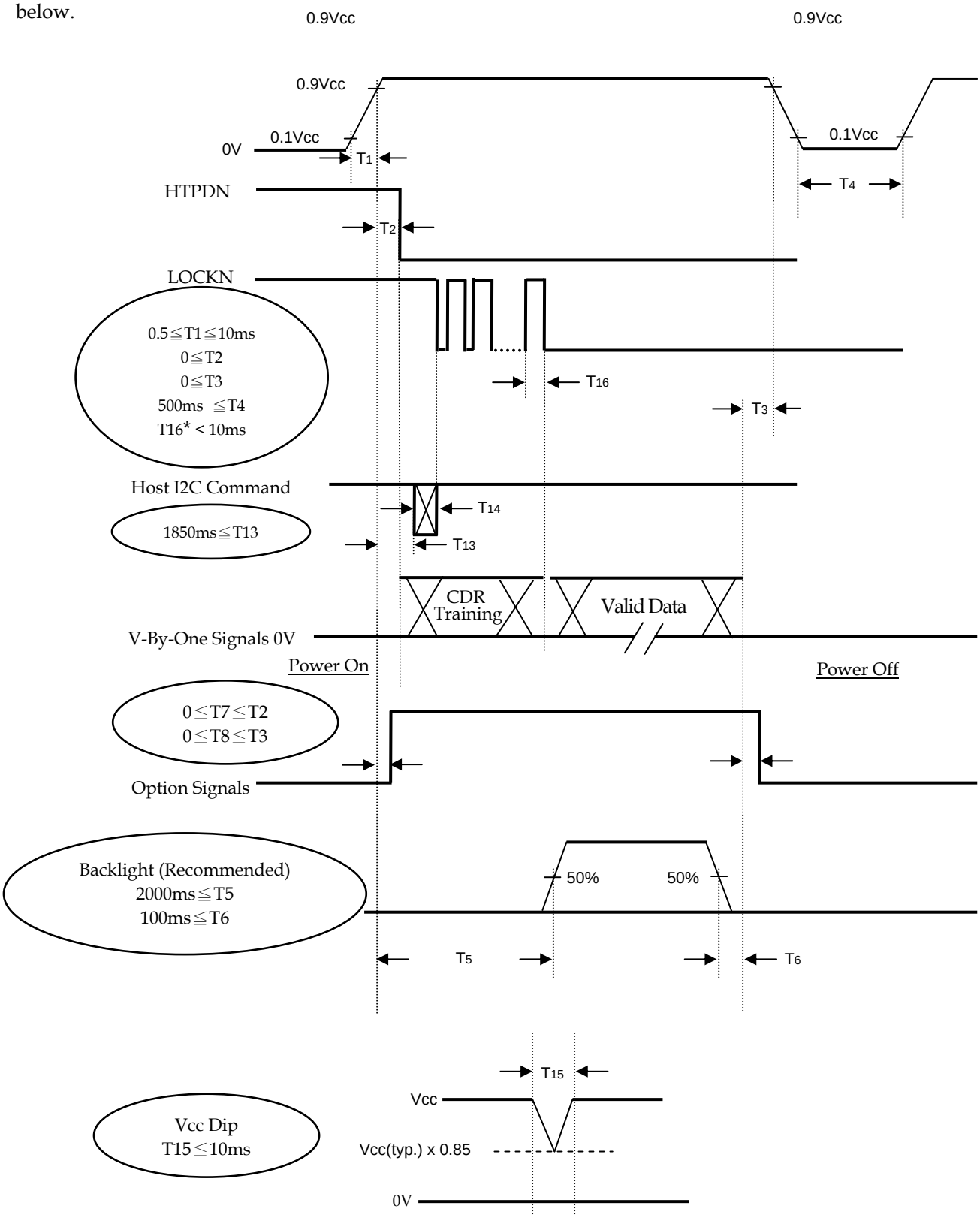
5.3 Byte Length and Color mapping of V-by-One HS

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 °C)

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



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

Note (2) Apply the 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. 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) Vcc must decay smoothly when power-off.

Note (7) T5 ＞ (T13 + T14)

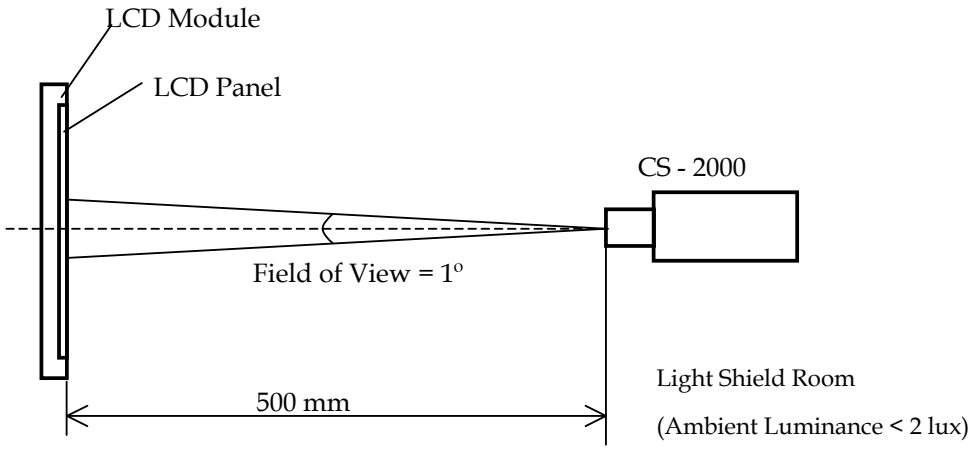
Note (8) T16, V-by-One signals shall be stabilized and follows timing specification which defined by section 6.1 & 6.2.

6. OPTICAL CHARACTERISTICS

6.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ±2	°C
Ambient Humidity	Ha	50 ±10	%RH
Vertical Frame Rate	Fr	60	Hz
Supply Voltage	V_{CC}	12.0 ±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"	-0.03	0.661	+0.03	-	(0)
		Rcy			0.328		-	
	Green	Gcx			0.283		-	
		Gcy			0.586		-	
	Blue	Bcx			0.138		-	
		Bcy			0.102		-	
	White	Wcx			0.316		-	
		Wcy			0.350		-	
Transmittance		T%	θ_x=0°, θ_Y =0° With INX Module@60Hz		5.6	-	%	(5)
Transmittance Variation		δT				1.3		(6)
Contrast Ratio		CR		3500	5000	-	-	(1),(3)
Response Time		Gray to gray	θ_x=0°, θ_Y =0° With INX Module@60Hz	-	9.5	19	ms	(1),(4)
Viewing Angle	Horizontal	θ_x+	CR≥10 With INX Module	80	89	-	Deg.	(1),(2)
		θ_x-		80	89	-		
	Vertical	θ_Y+		80	89	-		
		θ_Y-		80	89	-		

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. W, R,G, B are with signal input. BLU (V500DK4-KS7) is supplied by INX.

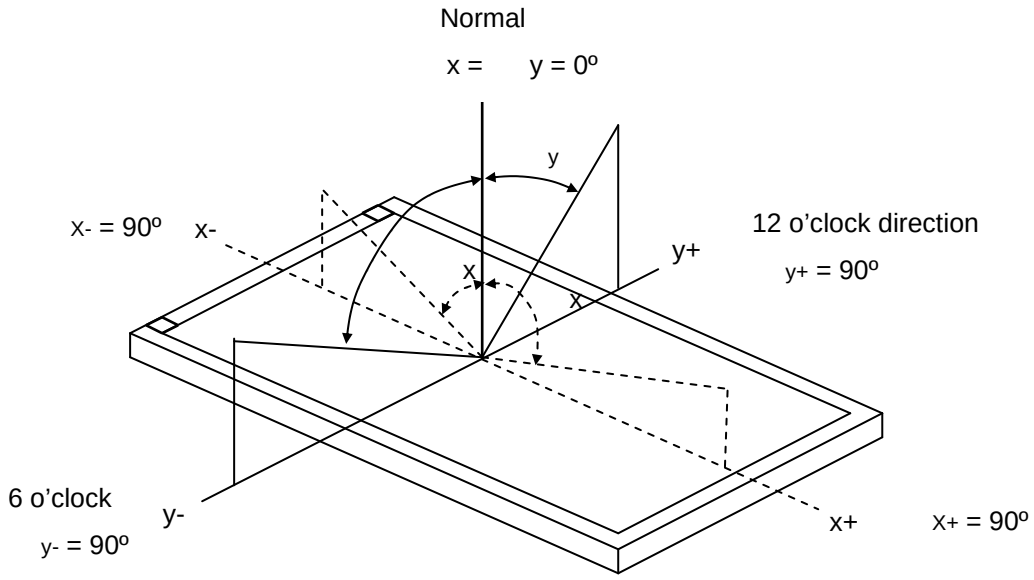
2.Calculate cell's spectrum.

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 (V500DK4-KS7) 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.

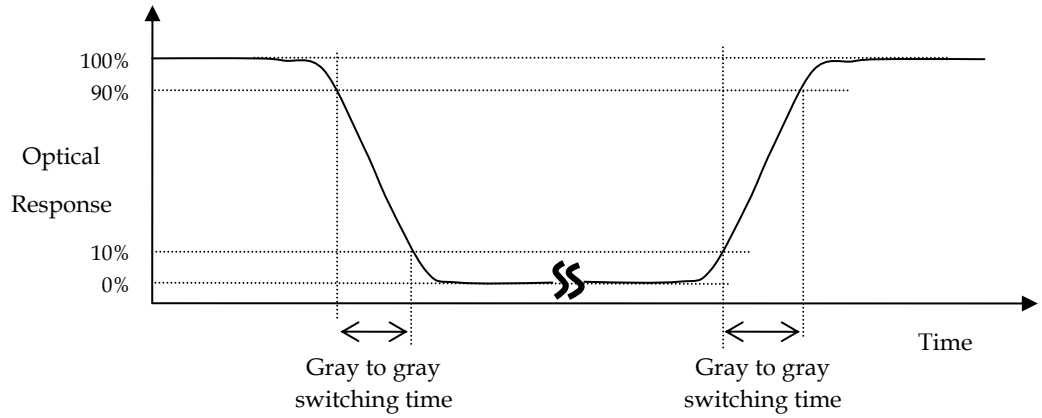
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L1023}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 1023

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 (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.

$$T(X) = \frac{L1023\,(X)\ \text{of LCD module}}{\text{Luminance}\,(X)\ \text{of BLU}} \times 100\%$$

L1023: Luminance of gray level 1023

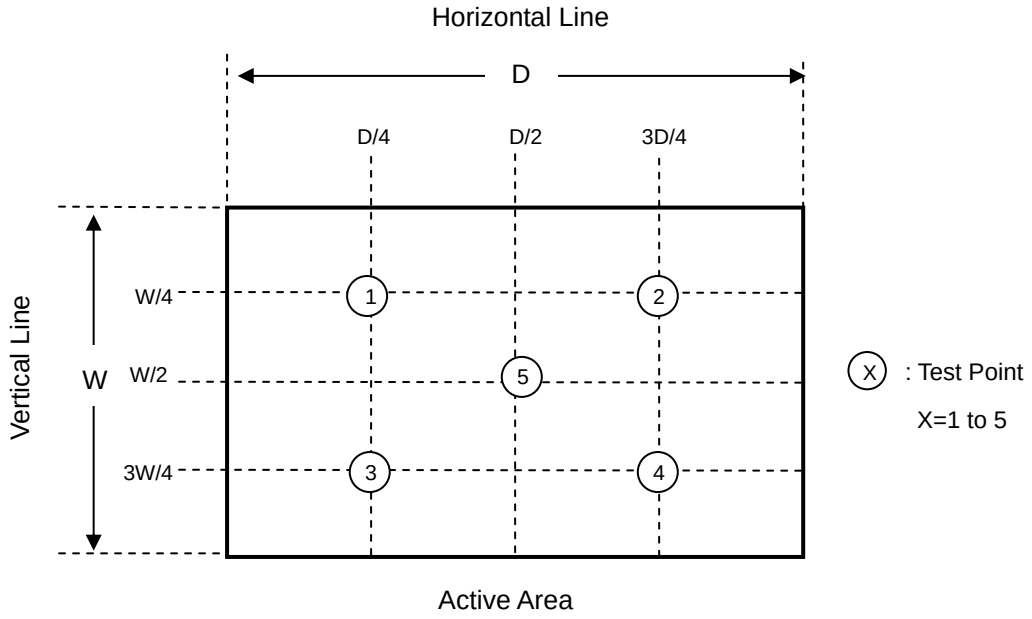
T(X) is corresponding to the point X1~X5 at the figure in Note (6).

Note (6) Definition of Transmittance Variation (δT)

Measure the transmittance at 5 points.

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

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 10ºC, the display quality might be reduced.

[17] Unpacking (Cartons/Tray plates) in order to prevent open cells broken:

[17.1] Moving tray plates by one operator may cause tray plates bent which may induce open cells broken. Two operators carry one carton with their two hands. Do not throw cartons/tray plates, avoid any impact on cartons/tray plates, and put down & pile cartons/tray plates gently.

[17.2] A tray plate handled with unbalanced force may cause an open cell damaged. Trays should be completely put on a flat platform.

[17.3] To prevent open cells broken, tray plates should be moved one by one from a plastic bag.

[17.4] Please follow the packing design instruction, such as the maximum number of tray stacking to prevent the deformation of tray plates which may cause open cells broken.

[17.5] To prevent an open cell broken or a COF damaged on a tray, please follow the instructions below:

[17.5.1] Do not peel a polarizer protection film of an open cell off on a tray

[17.5.2] Do not install FFC or LVDS cables of an open cell on a tray

[17.5.3] Do not press the surface of an open cell on a tray.

[17.5.4] Do not pull X-board when an open cell placed on a tray.

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

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

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

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

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

[18.3.2] Do not install FFC or LVDS cables of an open cell in a hard box.

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

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

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

[19.1] 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.

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

[19.3] 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.

[19.4] Handle open cells one by one.

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

[21] The suggestion of removing polarizer-protection film is illustrated as following

[21.1] Scan COF on the left side (Figure 1)

Remove slowly and follow the direction : from left-up to right-down

[21.2] Scan COF on the right side (Figure 2)

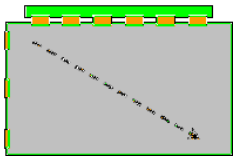
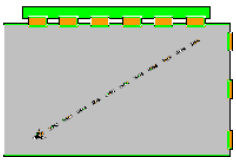
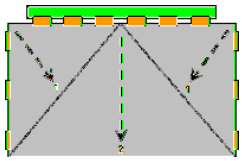
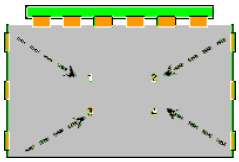
Remove slowly and follow the direction : from right-up to left-down

[21.3] Scan COF on the left and right side (Figure 3)

Remove slowly and follow the direction as marked by 1 and 2.

[21.4] Scan COF on the left and right side (Figure 4)

Remove slowly and follow the direction as marked by 1, 2, 3 and 4.

Figure 1	Figure 2	Figure 3	Figure 4
			

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 control.

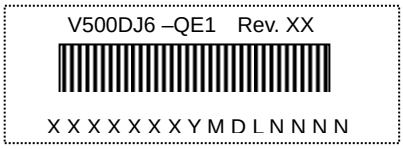
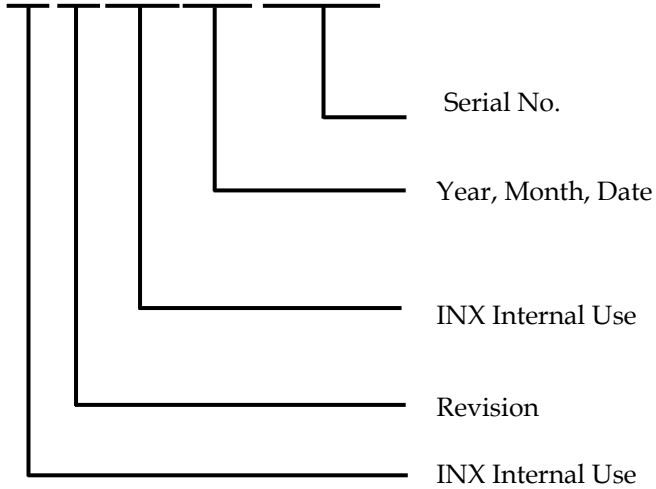


Figure.9-1 Serial No. Label on SPWB and Cell

Model Name : V500DJ6-QE1

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

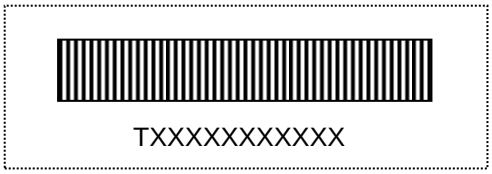
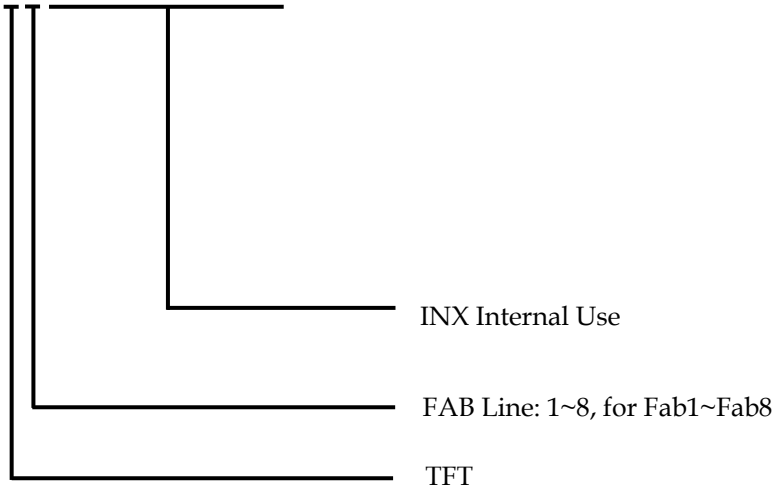


Figure.9-2 Panel ID Label on Cell

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

EPS Box :

(1) 17 LCD TV Panels / 1 Box

(2) Box dimensions : 1235 (L) X835 (W) X139 (H)mm

(3) Weight : approximately 40 Kg (17 panels per box)

(4) 153 LCD TV Panels / 1 Group

(5) Group dimensions : 1250 (L) X 850 (W) X1324 (H)mm

(6) Weight : approximately 380 Kg / 1 Group

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

(8) When transferring in warehouse or factory, the arm length of electric forklift or hand pallet truck must be longer than the pallet. INX recommend the length of arm should be ≥ 120 cm (for TV 50").

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

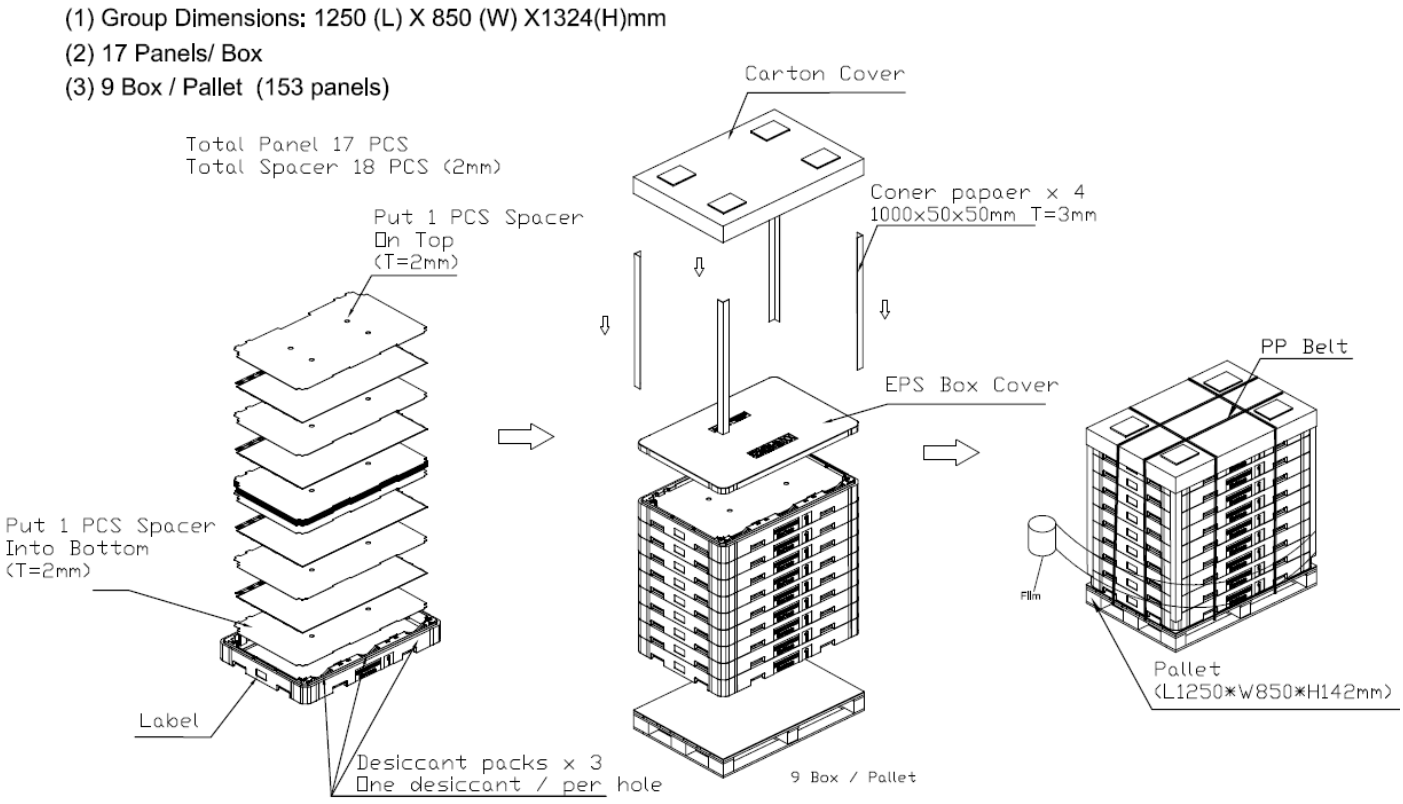
(10) The surface area of the worktable or carts should be greater than box size. INX recommend the dimensions of tabletop be ≥ 140x90 cm (for TV 50")

9.2 PACKAGING METHOD

Packaging method is shown in following figures.

EPS Box :

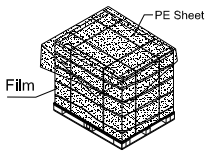
(1) Packing Method



(2) Shipping Mode

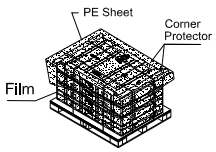
A TYPE (Air Transportation)

Full Stack



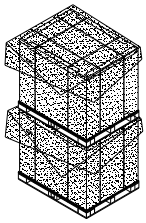
14 Box / Pallet

Non-full stack



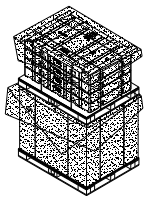
B TYPE (Sea&Land Transportation)

(40ft HQ Container)



14 Box / Pallet + 14 Box / Pallet

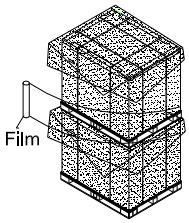
(40ft Container)



14 Box / Pallet + 12 Box / Pallet

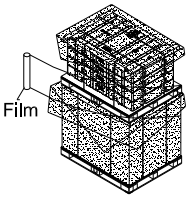
C TYPE (Sea&Land Transportation)

(40ft HQ Container)



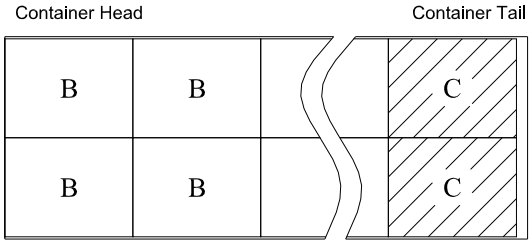
14 Box / Pallet + 14 Box / Pallet

(40ft Container)



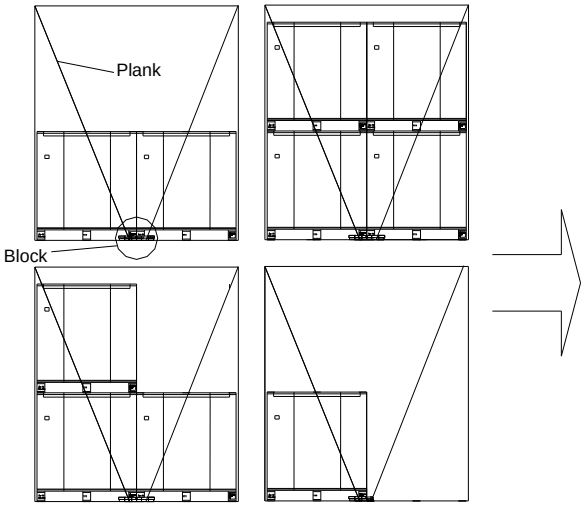
14 Box / Pallet + 12 Box / Pallet

40ft HQ Container & 40ft Container



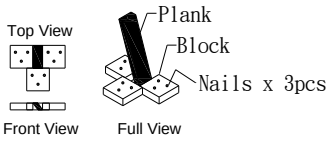
(3) The Fixed Way of Block and Plank in the Container Tail

The Fixed Way of Block and Plank in the Container Tail

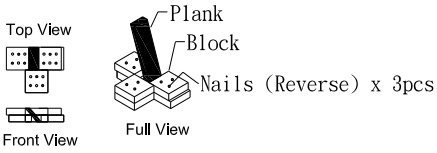


(Front View)

Step 1



Step 2



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

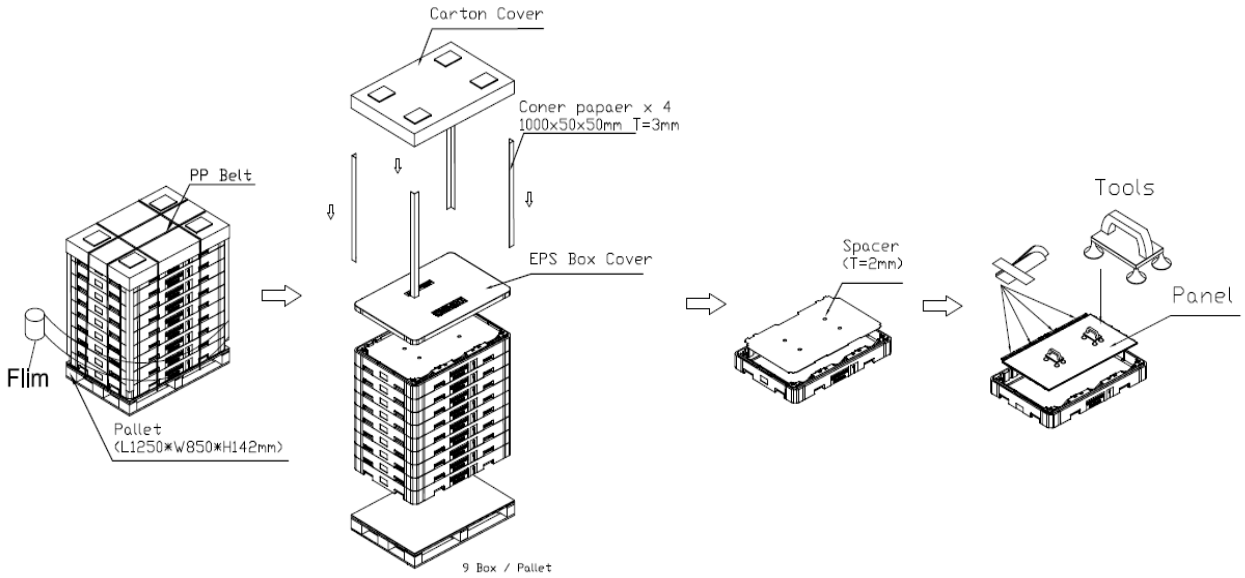
4. The Dimension Tolerance of Block, Plank and Nail is ±5%

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

EPS Box :



10. MECHANICAL CHARACTERISTIC