(√)Preliminary Specification
( ) Final Specification

TFT LCD SPECIFICATION

Product's Name： 56.6" Extreme Wide TFT LCD Module
Customer's Model NO: _____
Model NO： RV566FBM

For Customer's Acceptance Customer's Name: _____	
Approved by	Comment

Approved by	Checked by	Designed by

Please return to us one original of **"TFT LCD Specification"** with your approved signatures.

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RECORD OF REVISION

Version	Revise Date	Page	Content
A00	20190307	All	First issued.

1. General Description

1.1 Overview

RV566FBM is a 56.6" TFT Liquid Crystal Display product with driver ICs and 8 Lane V-by-one interface. This product supports 3840 x 470 Quad Full HDTV format and can display true 1.07G colors (8-bit+FRC).

1.2 Features

Model	Parameter	Items	Unit	Remark
LCD	Active area	1428.48(H) ×174.84(V)	mm	
	Border(L/R/U/D)	15.7/15.7/13/13	mm	
	Number of pixels	3840(H)x470(V)	mm	
	Bezel Area	1431.6(H)x178 (V)	mm	
	Transmittance	4.6%(typ)		without
	Color Gamut	70%(typ)		C Light(CF)
	Display colors	1.07G		
	Display mode	Normally Black		
	Contrast Ratio	5000:1		
	Response Time	9.5	ms	
	Optima Viewing Direction	Typ. 89(R)/89(L)/89(U)/89(D) (CR≧10)	Deg.	CR≧10
	Backlight	ELED		
	Brightness	1000 (Typ.)	nits	
Power	Consumption	46W (Max.)	Watt	
Operation Conditions	Temperature	0 ~ 60°C		
	Humidity	20% ~ 90%		
Dimensions	1463±1(H) x 204±0.8(V)x20±0.5(D)		mm	
Weight	Net (Kg)	TBD±0.5		
	Gross (Kg)	TBD±1 (4pcs/box)		
Package	Height (mm)	TBD (L) *TBD (W) *TBD (H)		

2. Absolute Maximum Ratings

2.1 Absolute Ratings Of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	0	+60	ºC	(1), (3)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2), (3)

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

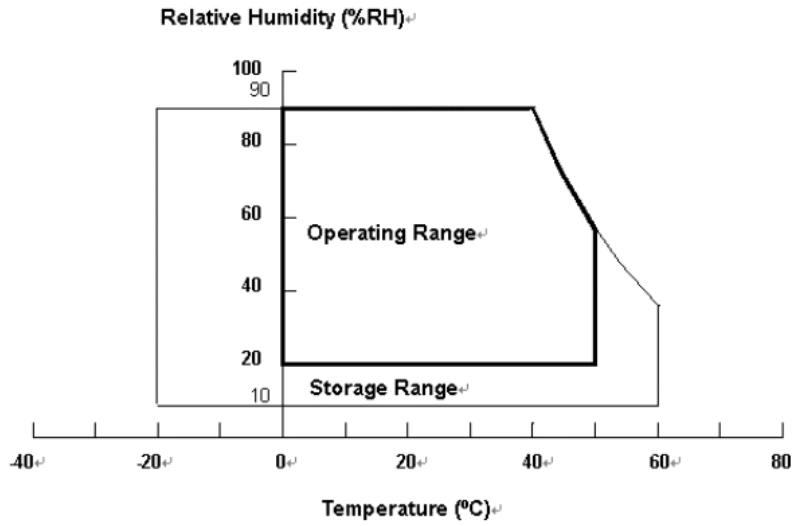
(a) 90 %RH Max. (Ta ≦ 40 ºC).

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

(c) No condensation.

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

Note (3) 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.



3. Electrical Characteristics

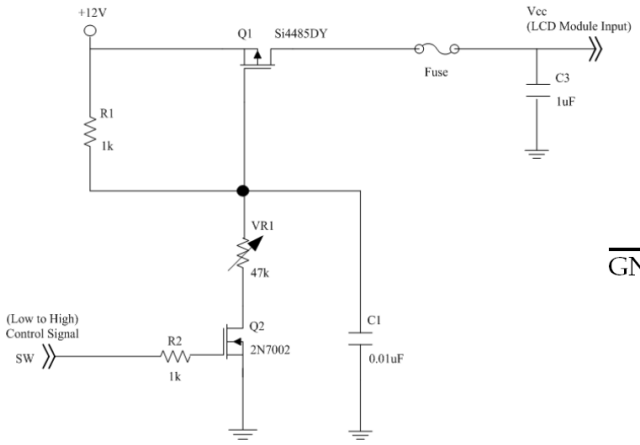
3.1 TFT LCD Module

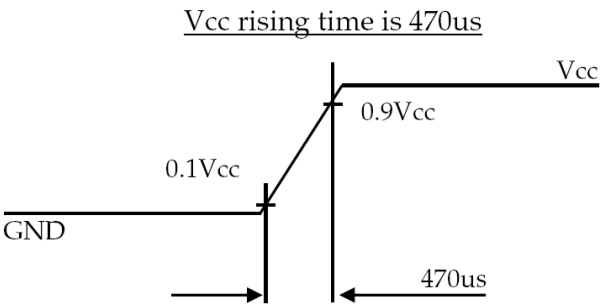
(Ta = 25 ± 2 ºC)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	10.8	12	13.2	V	(1)
Rush Current		IRUSH	-	-	4.5	A	(2) (3)
Power Consumption	White Pattern	PT	-	15.732	17.305	W	
	Black Pattern	PT	-	15.735	17.308	W	
	Horizontal Stripe	PT	-	42.780	47.058	W	
Power Supply Current	White Pattern	-	-	1.311	1.442	A	
	Black Pattern	-	-	1.312	1.443	A	
	Horizontal Stripe	-	-		3.922	A	
VbyOne HS	Differential Input High	VLVTH	-	-	+50	mV	
	Differential Input Low	VLVTL	-50	-	-	mV	
	Differential input voltage (single-end)	|VID|	200	-	600	mV	
	Differential Input Resistor	RRIN	80	100	120	ohm	
CMOS interface	Input High Threshold Voltage	VIH	2.7	-	3.3	mV	
	Input Low Threshold Voltage	VIL	0	-	0.7	mV	

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 consumption and power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, fv =60 Hz, whereas a power dissipation check pattern below is displayed

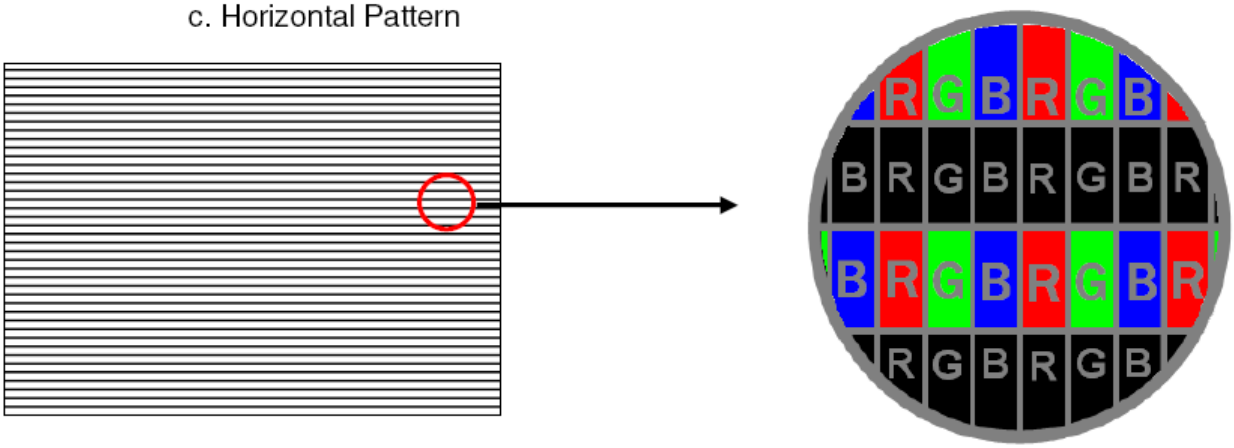
a. White Pattern

Active Area

b. Black Pattern

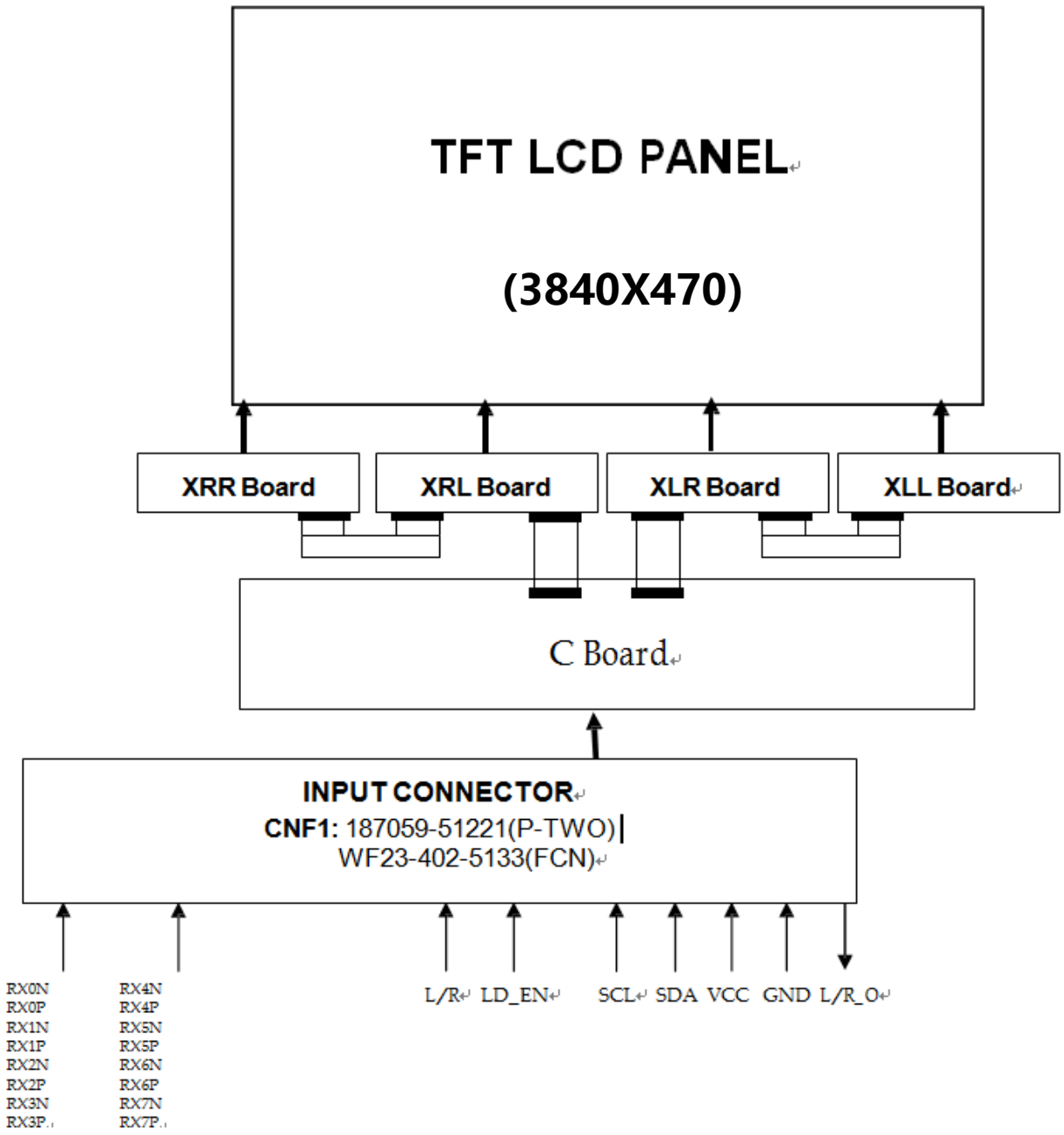
Active Area

c. Horizontal Pattern



4. Block Diagram Of Interface

4.1 TFT LCD Module



5. Input Terminal Pin Assignment

5.1 TFT LCD Module VbyOne HS Input

CNF1 Connector Pin Assignment (187059-51221(P-TWO), WF23-402-5133(FCN))

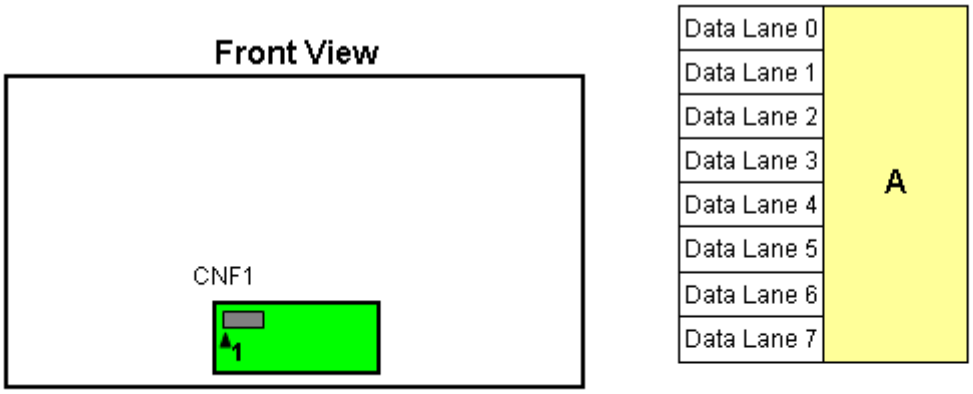
Matting connector : FI-RE51HL (JAE)

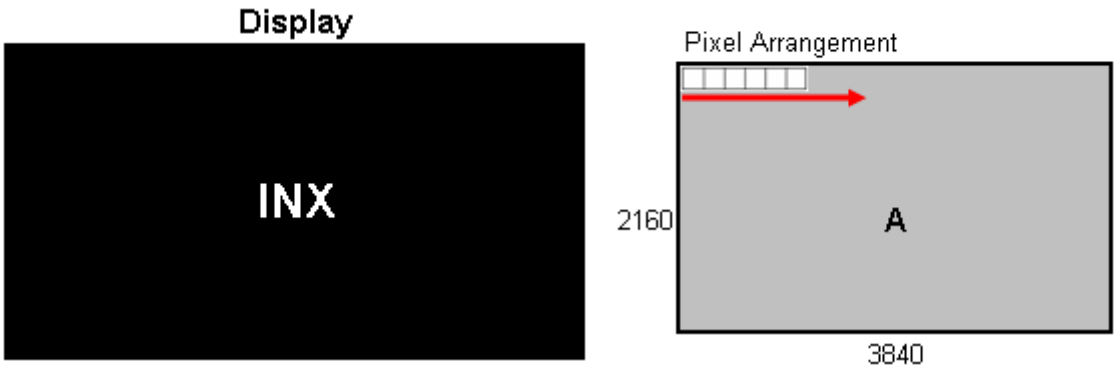
Pin	Name	Description	Note
1	Vin	Power input (+12V)	
2	Vin	Power input (+12V)	
3	Vin	Power input (+12V)	
4	Vin	Power input (+12V)	
5	Vin	Power input (+12V)	
6	Vin	Power input (+12V)	
7	Vin	Power input (+12V)	
8	Vin	Power input (+12V)	
9	N.C.	No Connection	(8)
10	GND	Ground	
11	GND	Ground	
12	GND	Ground	
13	GND	Ground	
14	GND	Ground	
15	L/R_O	Output signal for Glasses Left Right signal,	(4)
16	L/R	Input signal for Left/Right synchronous signal.	(2)
17	N.C.	No Connection	(8)
18	SDA	I2C Data signal	(9)
19	SCL	I2C Clock signal	(9)
20	N.C.	No Connection	
21	N.C.	No Connection	(8)
22	LD_EN	Local Dimming Mode Enable.	(3) (5)
23	N.C.	No Connection	(8)
24	N.C.	No Connection	(8)
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® HS Data Mapping

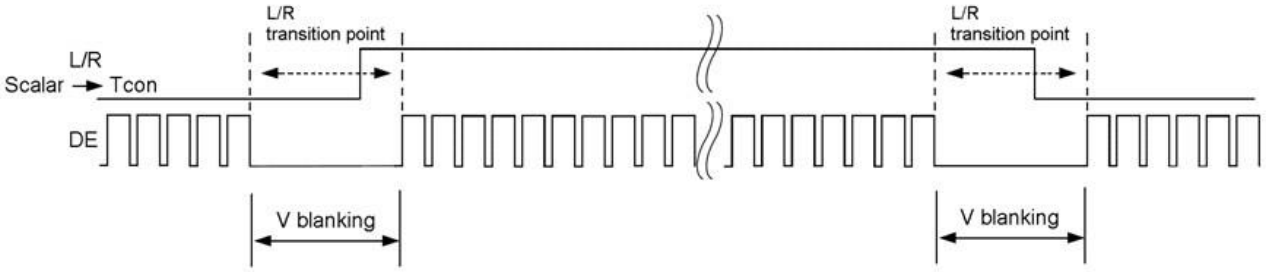
Area	Lane	Data Stream
A	Lane 0	1, 9, 17, ..., 3825, 3833
	Lane 1	2, 10, 18, ..., 3826, 3834
	Lane 2	3, 11, 19, ..., 3827, 3835
	Lane 3	4, 12, 20, ..., 3828, 3836
	Lane 4	5, 13, 21, ...,3829, 3837
	Lane 5	6, 14, 22, ..., 3830, 3838
	Lane 6	7, 15, 23, ..., 3831, 3839
	Lane7	8, 16, 24, ..., 3832, 3840





Note (2) 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 (3) Local dimming enable selection. (Default: enable)

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

LD_EN	Note
L	Local Dimming Disable
H or Open	Local Dimming Enable

LD_EN enable pin should be set in power on stage.

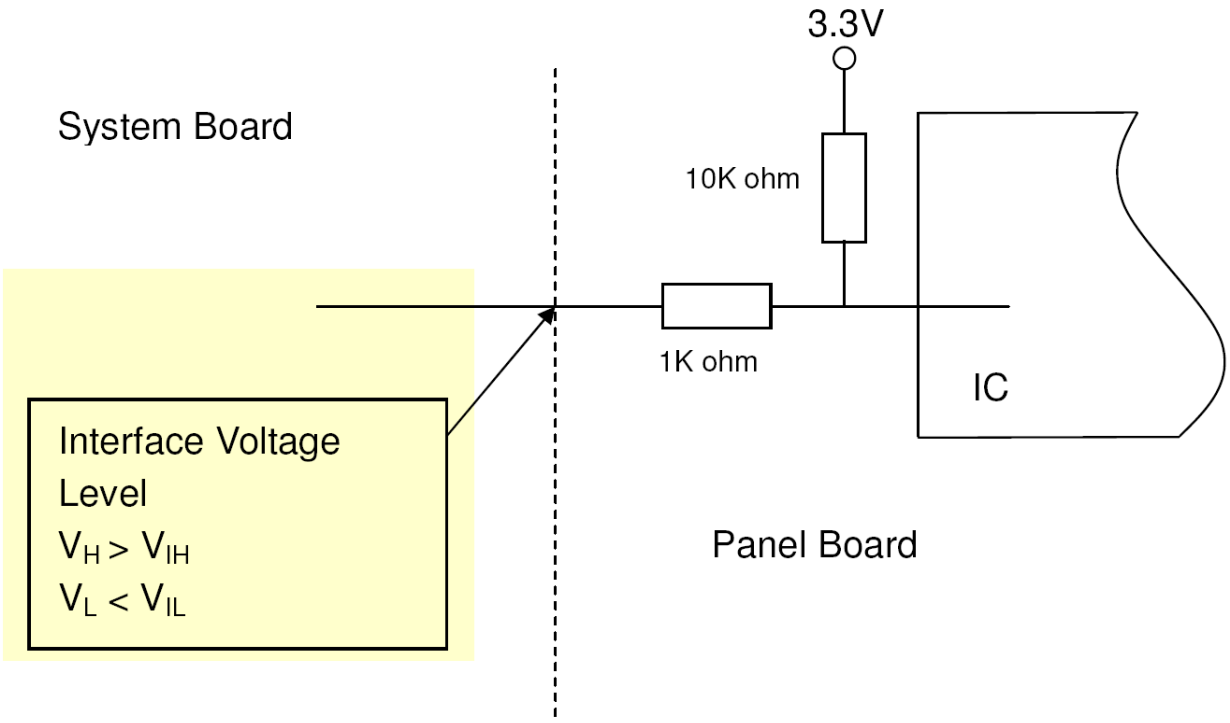
Backlight should be turned off in the period of changing original setting after power on.

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

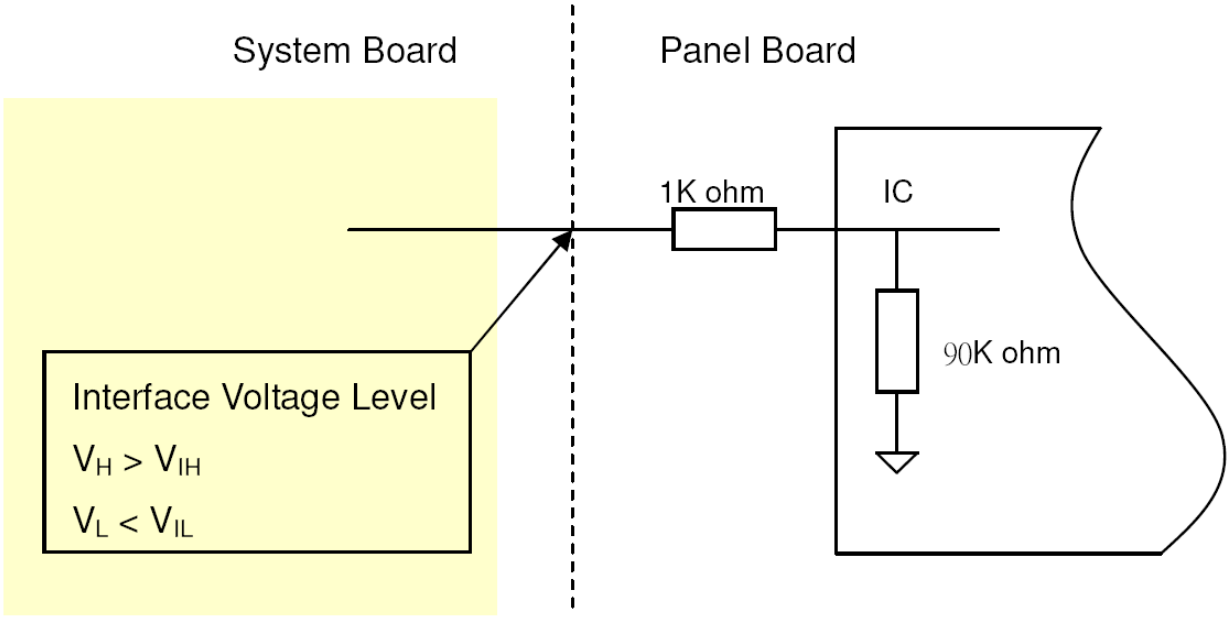
L= 0V , H= +3.3V

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

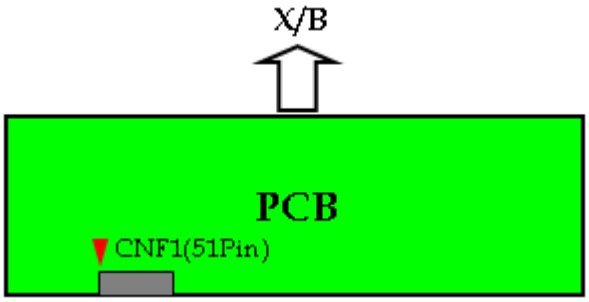
Note (5) Interface optional pin has internal scheme as following diagram. Customer should keep the interface voltage level requirement which including Panel board loading as below.



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) V-by-One 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) The detail setting such as I2C command or timing requirement in FHD/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.

5.2 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	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
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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	1
	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	1	0
	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

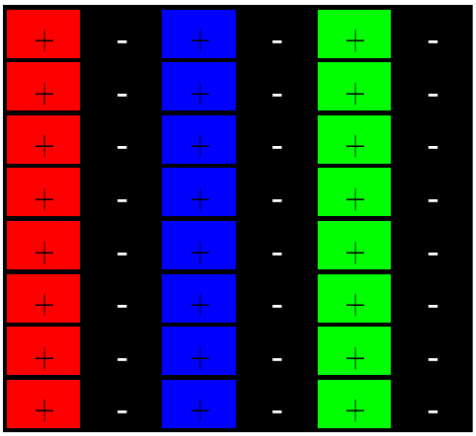
Note (1) 0: Low Level Voltage，1: High Level Voltage

5.3 Flicker (Vcom) Adjustment

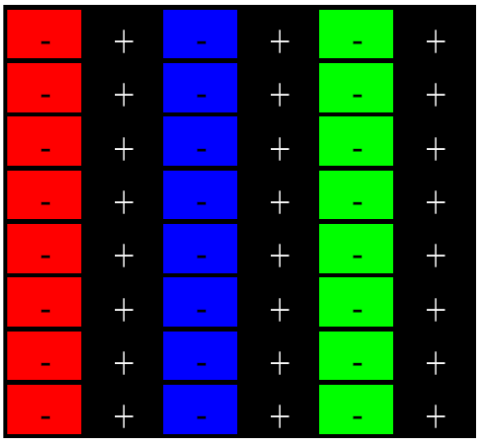
(1) Adjustment Pattern:

Column-inversion pattern was shown as below. If customer needs below pattern, please directly contact with INX 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 to INX auto V-com adjustment O.I. Below items is suggested to be ready before Digital V-com adjustment in customer LCM line.

a. USB Sensor Board.

b. Programmable software

6. Interface Timing

6.1 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	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	

6.1.1 Input Timing spec for QFHD Frame Rate = 50Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	49	50	51	Hz	(8),(9)
Vertical Active Display Term (8 Lane,3840X2160 Active Area)	2D Mode	Total	Tv	2240	2250	2450	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	80	90	290	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	

6.1.2 Input 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	(8),(9)
	3D Mode			60			Hz	(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	
	3D Mode	Total	Tv	2250			Th	
		Display	Tvd	2160			Th	(7)

		Blank	Tvb	90			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	
	3D Mode	Total	Th	530	550	600	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	**70**	120	Tc	

6.1.3 Input Timing Spec for FHD, Frame Rate = 50Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	49	50	51	Hz	(8),(9)
Vertical Active Display Term (2 Lane,1920X1080 Active Area)	2D Mode	Total	Tv	1104	1350	1395	Th	Tv=Tvd+Tvb
		Display	Tvd	1080			Th	
		Blank	Tvb	24	270	315	Th	
Horizontal Active Display Term (2 Lane,1920X1080 Active Area)		Total	Th	1060	1100	1150	Tc	Th=Thd+Thb
		Display	Thd	960			Tc	
		Blank	Thb	100	140	190	Tc	

6.1.4 Input Timing Spec for FHD, Frame Rate = 60Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	59	60	61	Hz	(8),(9)
	3D Mode			60			Hz	(6)
Vertical Active Display Term (2 Lane,1920X1080 Active Area)	2D Mode	Total	Tv	1104	1125	1395	Th	Tv=Tvd+Tvb
		Display	Tvd	1080			Th	
		Blank	Tvb	24	45	315	Th	
	3D Mode	Total	Tv	1125			Th	
		Display	Tvd	1080			Th	(7)
		Blank	Tvb	45			Th	
Horizontal Active	2D Mode	Total	Th	1060	1100	1150	Tc	Th=Thd+Thb

Display Term (2 Lane,1920X1080 Active Area)		Display	Thd	960			Tc	
		Blank	Thb	100	140	190	Tc	
	3D Mode	Total	Th	1060	1100	1150	Tc	
		Display	Thd	960			Tc	
		Blank	Thb	100	140	190	Tc	

6.1.5 Input Timing Spec for FHD, Frame Rate = 100Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	98	100	102	Hz	(8),(9)
Vertical Active Display Term (4 Lane,1920X1080 Active Area)	2D Mode	Total	Tv	1108	1350	1370	Th	Tv=Tvd+Tvb
		Display	Tvd	1080			Th	
		Blank	Tvb	28	270	290	Th	
Horizontal Active Display Term (4 Lane,1920X1080 Active Area)		Total	Th	530	550	650	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	70	170	Tc	

6.1.6 Input Timing Spec for FHD, Frame Rate = 120Hz

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	118	120	121	Hz	(8),(9)
	3D Mode			120			Hz	(6)
Vertical Active Display Term (4 Lane,1920X1080 Active Area)	2D Mode	Total	Tv	1108	1125	1370	Th	Tv=Tvd+Tvb
		Display	Tvd	1080			Th	
		Blank	Tvb	28	45	290	Th	
	3D Mode	Total	Tv	1125			Th	
		Display	Tvd	1080			Th	(7)
		Blank	Tvb	45			Th	
Horizontal Active Display Term (4 Lane,1920X1080 Active Area)	2D Mode	Total	Th	530	550	650	Tc	Th=Thd+Thb
		Display	Thd	480			Tc	
		Blank	Thb	50	70	170	Tc	
	3D Mode	Total	Th	530	550	650	Tc	Th=Thd+Thb

		Display	Thd	480			Tc	
		Blank	Thb	50	70	170	Tc	

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

Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	23.5	24	24.5	Hz	(8),(9)
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)		Total	Th	1060	1100	1180	Tc	Th=Thd+Thb
		Display	Thd	960			Tc	
		Blank	Thb	100	140	220	Tc	

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

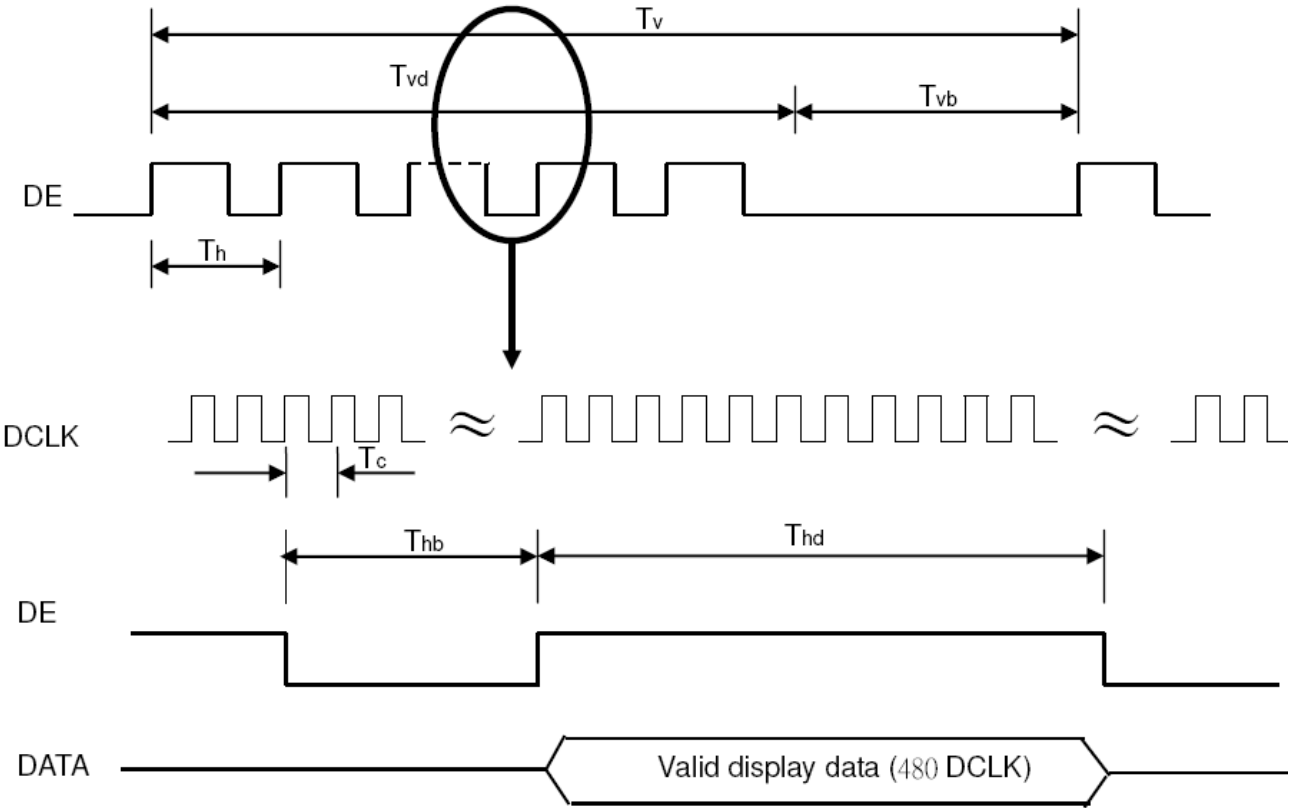
Signal	Item		Symbol	Min.	Typ.	Max.	Unit	Note
Frame Rate	2D Mode		F_r	29.5	30	30.5	Hz	(8),(9)
	3D Mode			30			Hz	(6)
Vertical Active Display Term (4 Lane,3840X2160 Active Area)	2D Mode	Total	Tv	2208	2250	2450	Th	Tv=Tvd+Tvb
		Display	Tvd	2160			Th	
		Blank	Tvb	48	90	290	Th	
	3D Mode	Total	Tv	2250			Th	
		Display	Tvd	2160			Th	(7)
		Blank	Tvb	90			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	80	140	220	Tc	
	3D 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:

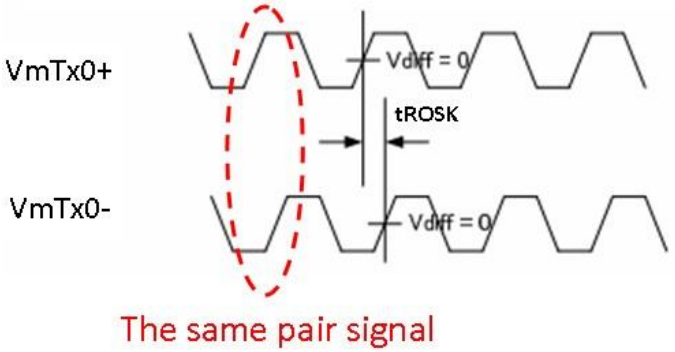
Fclkin(max) ≧ Fr × Tv × Th

Fr1 × Tv × Th ≧ Fclkin(min)

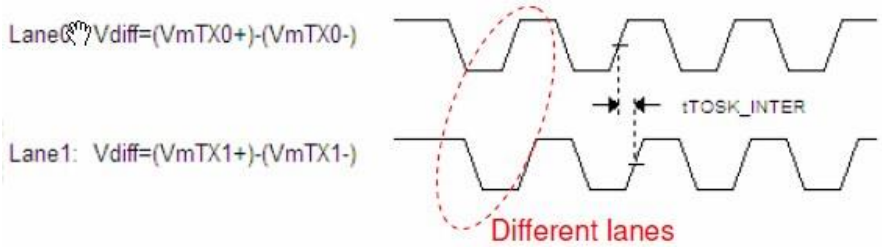
INPUT SIGNAL TIMING DIAGRAM



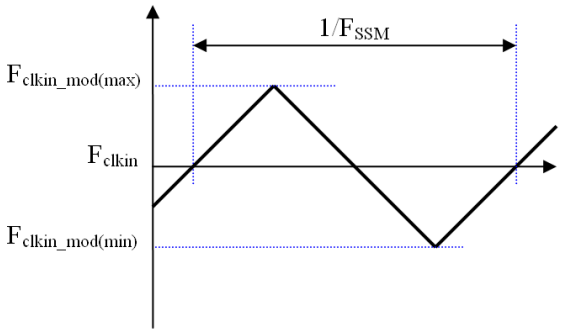
Note (2) Intra-pair Data skew



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



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



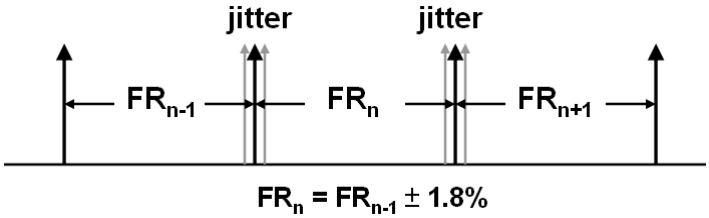
Note (5) Please fix the Vertical timing (Vertical Total =TBD / Display = TBD / Blank = TBD) in 120Hz 3D mode

Note (6) In 3D mode, the set up Fr6 in Typ. ±3 Hz .In order to ensure that the electric function performance to avoid no display symptom.(Except picture quality symptom.)

Note (7) In 3D mode, the set up Tv and Tvb in Typ. ±30.In order to ensure that the electric function performance to avoid no display symptom.(Except picture quality symptom.)

Note (8) The frame-to-frame jitter of the input frame rate is defined as the above figures. FRn = FRn-1 ± 1.8%.

Note (9) The setup of the frame rate jitter > 1.8% may result in the cosmetic LED backlight symptom but the electric function is not affected.



6.2 V by One Input Signal Timing Diagram

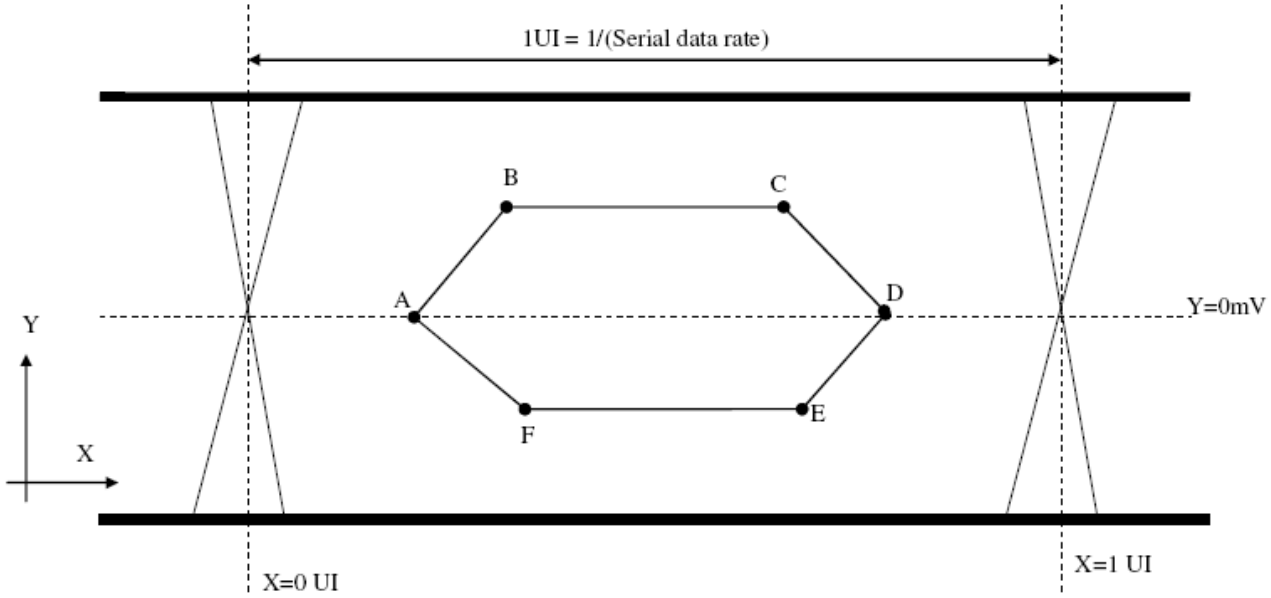


Table 1 Eye Mask Specification

	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"

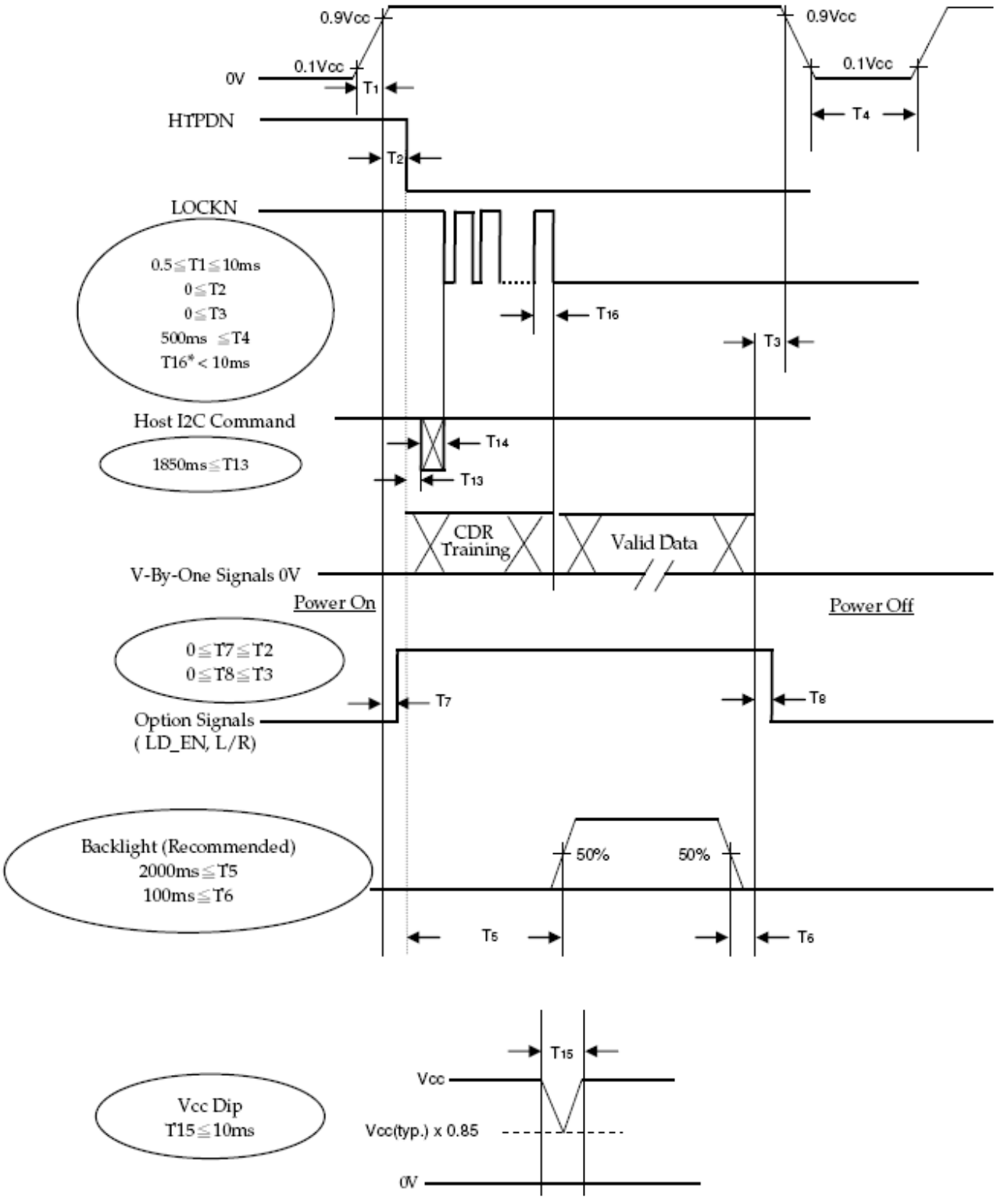
6.3 Byte Length and Color mapping of V-by-One HS

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]

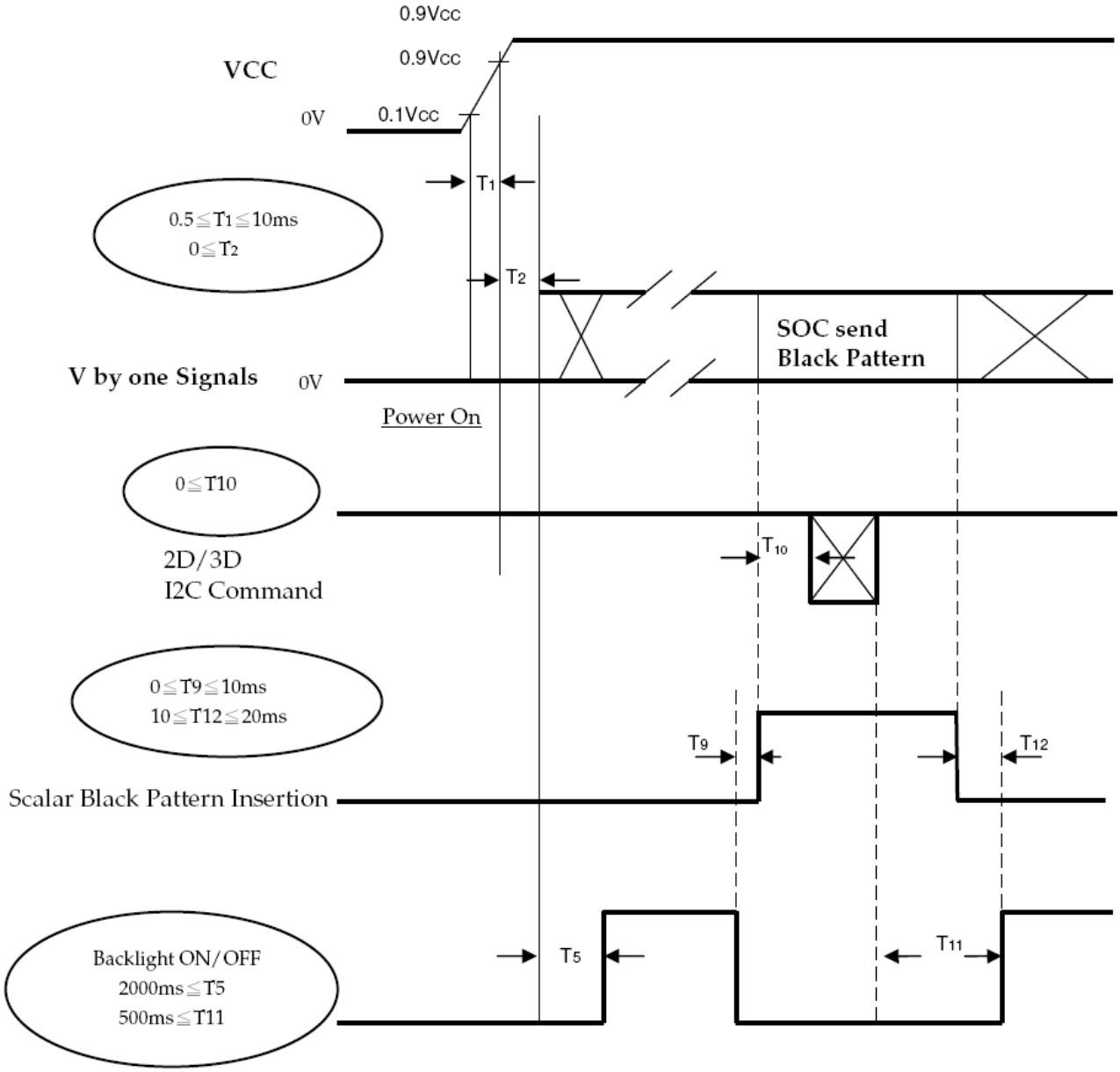
6.4 Power ON/OFF Sequence

(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.



6.5 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. 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 decay smoothly when power-off.

Note (8) T5 Backlight turn on time depend on T14 command length+T13

–

7. Backlight Connector

7.1 Led Lightbar Unit Characteristics (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Per Light Bar Voltage	V_W	56	--	72	V_{RMS}	I_L =320mA (One channel)
Backlight Power	W	--	--	46	W	I_L =320mA x 2=640mA
Backlight Current	I_L	--	320x2	--	mA_{RMS}	
Backlight Lifetime	hr	30000			hrs	

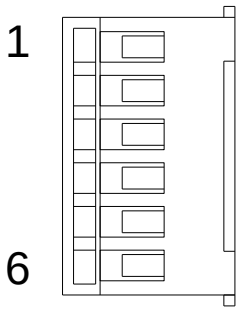
7.2 Backlight Unit Connector Definition

It connect to output connector YH2.0 on supply converter PCB. And output 1pcs connectors.

CN1/CN2 Connector（Connect To LED Bar）YH2.0-6

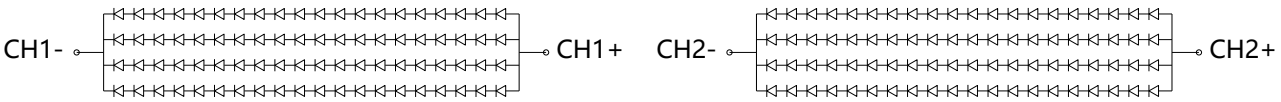
Pitch：2.0mm

Pin Assignment：



Pin No.	Symbol	Feature
1	CH1+	VLED OUT
2	CH2+	VLED OUT
3	NC	NC
4	NC	NC
5	CH1-	I RETURN
6	CH2-	I RETURN

The Light bar Diagram



LED Numbers: 20*4*2=160LED 2bar / BLU

8.Led Backlight Inverter

8. 1.Input Electrical Characteristics

NO	Item	Symbol	Min	Type	Max	Unit
1	Input Voltage	Vin	10.8	24	26.4	V
2	Input Current	Iin	0.4	0.85	2.5	A
3	Input Power	Pin	----	19.7	46	W
4	Brightness Voltage	Vadj	0 (bright)	---	5(dark)	V
5	Control Voltage	Enable Von=1.5---5.0V Disable Voff=0---0.5V				

8. 2.Output electrical characteristics

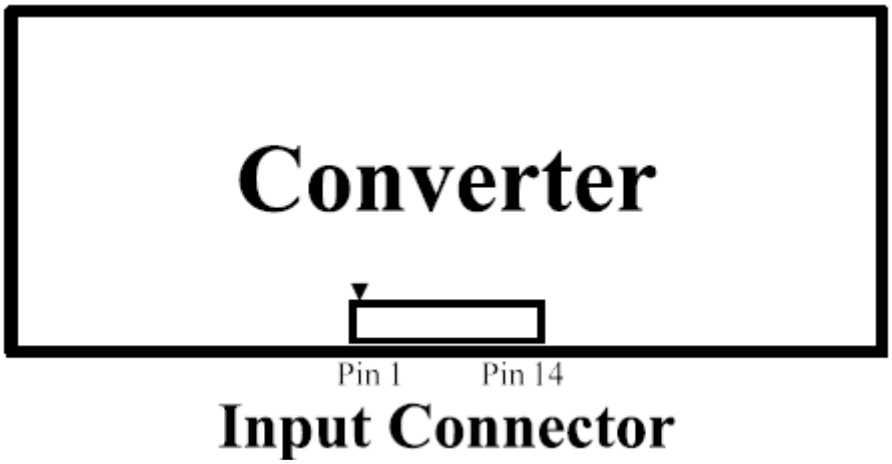
Item	Symbol	Test Conditions	Min	Type	Max	Unit
Output Current (per group)	Ioutpg	Vin=12.0V; Von=5V; Vadj=0V		320	-	mA
Output Voltage	Vout	Vin=12.0V; Von=5V; Vadj=0V	56	60	72	V
Efficiency	η	Vin=12.0V; Von=5V; Vadj=0V		93	---	%
Output otal group	Ggp	2		2		
Total Output Current	R	1+0.5+3.3		640		mA
						mA
	R					mA
			-		-	mA

The parameter of upon will change when the LCD module changes.

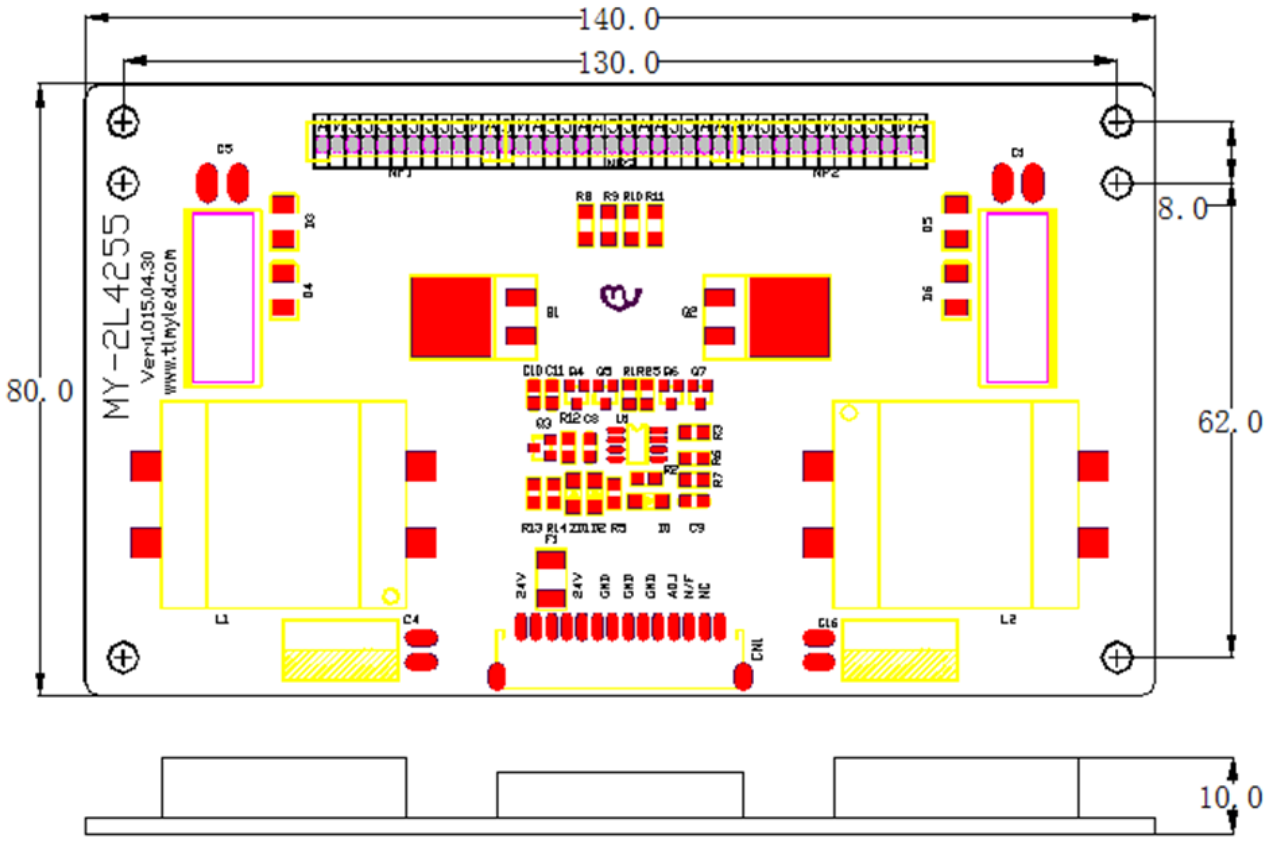
8. 3.Pin assignments

Input connector: CN1 [Connector Type : PHR-6(JST)Pitch 2.0mm 6Pin.]			
Pin No.	Symbol	Description	Parameter
1~2	+12V	Supply voltage	10.8~26.4V
3	N/F	Standby/Operation	On =2--5.0V Off=0-0.5V
4	ADJ	PWM/100-1000Hz	100%=Brightness Max 10%=Brightness Min
5~6	GND	Ground	0V

Input connector pin order defined as follows

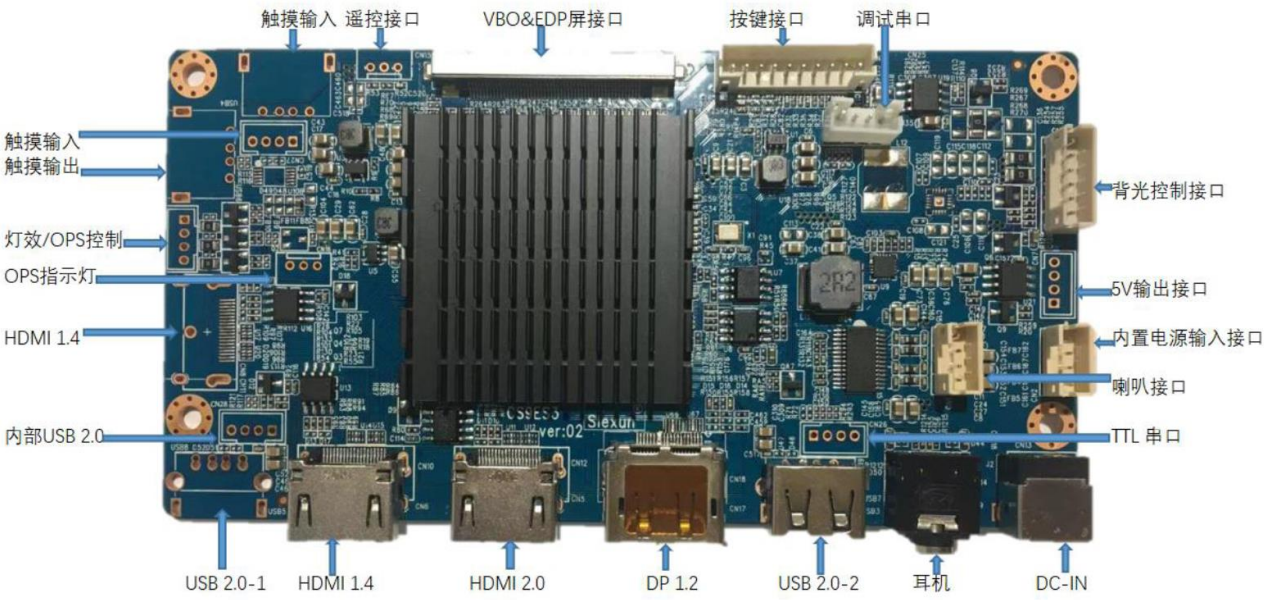


8. 4.Mechanical Dimension
Dimension of P.C.B.
Unit: mm
Tolerance:±0.5mm



9. DISPLAY DRIVER BOARD

9.1 IN TERFACE



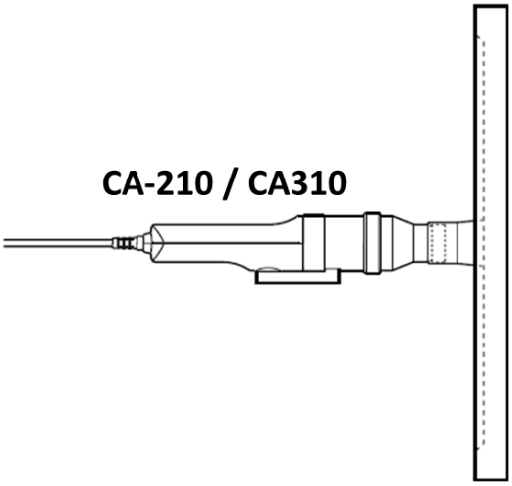
9.2 CONFIGURATION

Chip	MST9U13Q1	
Interface Type	8-lanes V-by-One/eDP(HBR) 10-bit	
Pixel Format	Max. 3840x2160/60Hz	
Video input	1*HDMI-1.4	Max. 3840x2160/30Hz
	1*HDMI-1.4	Max. 3840x2160/60Hz
	1*DP-1.2a	Max. 3840x2160/60Hz
Audio output	2*8W@8ohms, THDN<10%@1KHz	
USB	1*USB2.0	Software upgrade
	1*USB2.0	Touch the output
Power	DC 12V	
Function	MENU，PLUS，MINUS，EXIT，POWER	
OSD	Simplified Chinese, English, Japanese, Korean, panish, etc	

10. OPTICAL CHARACTERISTICS

10.1 TEST CONDITIONS

Optical characteristics are determined after the monitor has been 'ON' and stable for more than 5 minutes in a general environment at 25°C. The values specified are at an approximate distance 0cm from the LCD surface at a viewing angle of φ and θequal to 0°.



10.2 OPTICAL CHARACTERISTICS

The relative measurement methods of optical characteristics are shown as below.

Item		Symbol	Condition	Min.	Typ.	Max.	Un	Note
Contrast Ratio		CR	x=0, Y =0 Viewing Angle at Normal Direction	3500	5000	—	—	(1)
Response Time		G to G			9.5		ms	(3)
Center Luminance of White		LC		800	1000			（1）
Luminance Variation		δWHITE(9P)		70			%	（1）
Color Chromaticity	Red	Rx		Typ. -0.03	0.655	Typ. +0.03	—	
		Ry			0.320		—	
	Green	Gx			0.286		—	
		Gy			0.603		—	
	Blue	Bx			0.133		—	
		By			0.111		—	
	White	Wx		0.269	0.299	0.329	—	
		Wy		0.312	0.342	0.372	—	
Viewin g Angle	Horizontal	x+	CR>10	80	89	—	De g.	(1)(2)
		x-		80	89	—		
	Vertical	Y+		80	89	—		
		Y-		80	89	—		

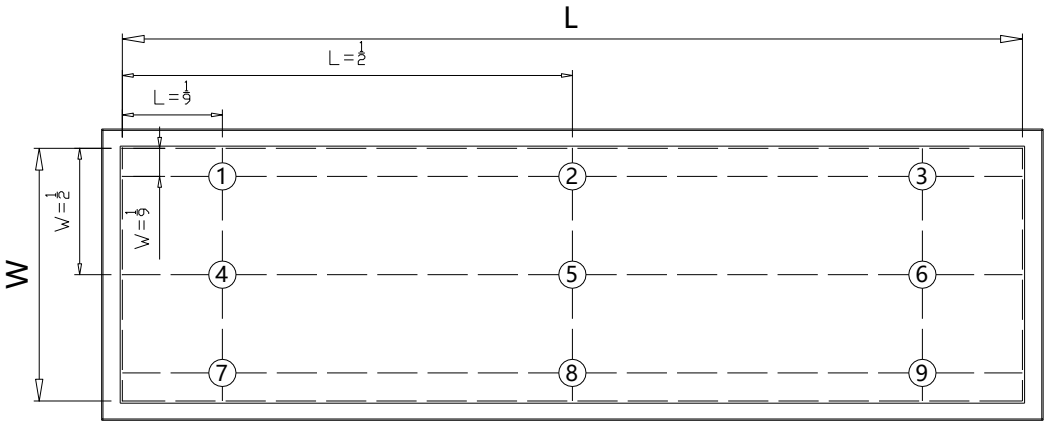
Note:

1. The value is for reference.

2. CR is defined as

   Contrast Ratio= Surface Luminance of Lon5/Surface Luminance of Loff5

3. Surface luminance is luminance value at point 5 across the LCD surface 0cm from the surface with all pixelsdisplaying white. For more information seethe figure bellow. LWH=Lon5 where Lon5 is the luminance with all pixelsdisplaying white at center 5 location.



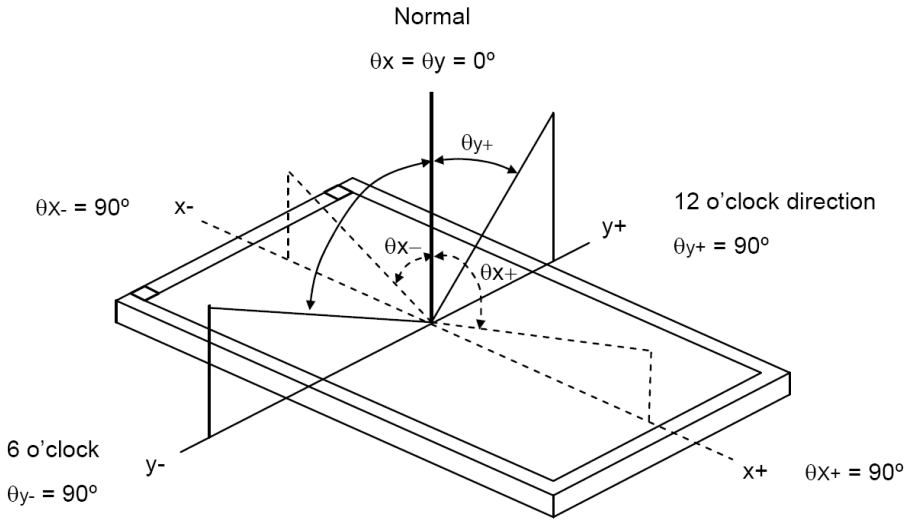
4. The variation in surface luminance, δWHITE(9P), is defined as

δWHITE(9P)= Min (Lon1,Lon2,…,Lon9) / Max (Lon1,Lon2,…,Lon9)

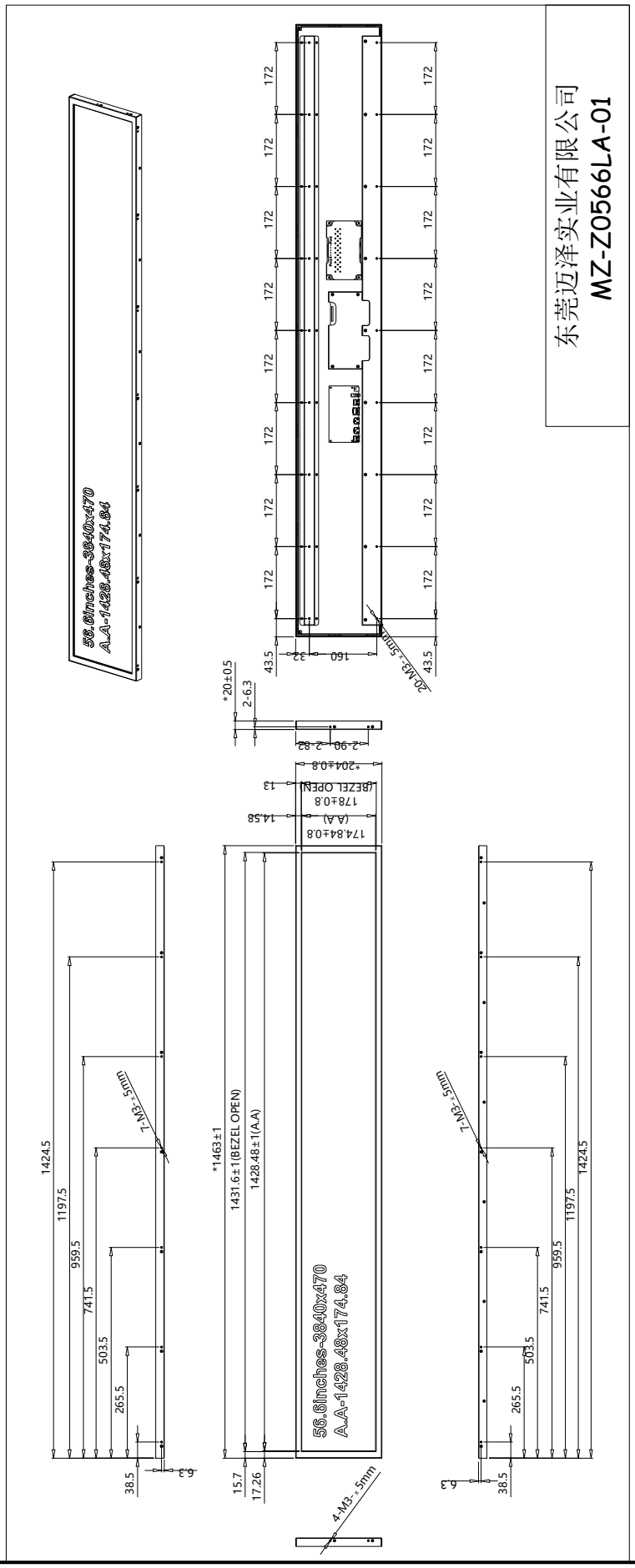
5. Response time Tγis the average time required for display transition by switching the input signal for fiveluminance ratio (0%,25%,50%,75%,100% brightness matrix) and is based on Fv=60Hz to optimize.

6. According to the original panel specification, viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see the figure bellow. The viewing angle measurement method and values are from the original panel spec.

7. Color chromaticity is measured at point 5



11. Mechanical Characteristics



12. Label Definition

12.1 BOE Product Label Definition(TBD)

12.2Product Label Position

13. Packaging

13.1 Packing Specifications

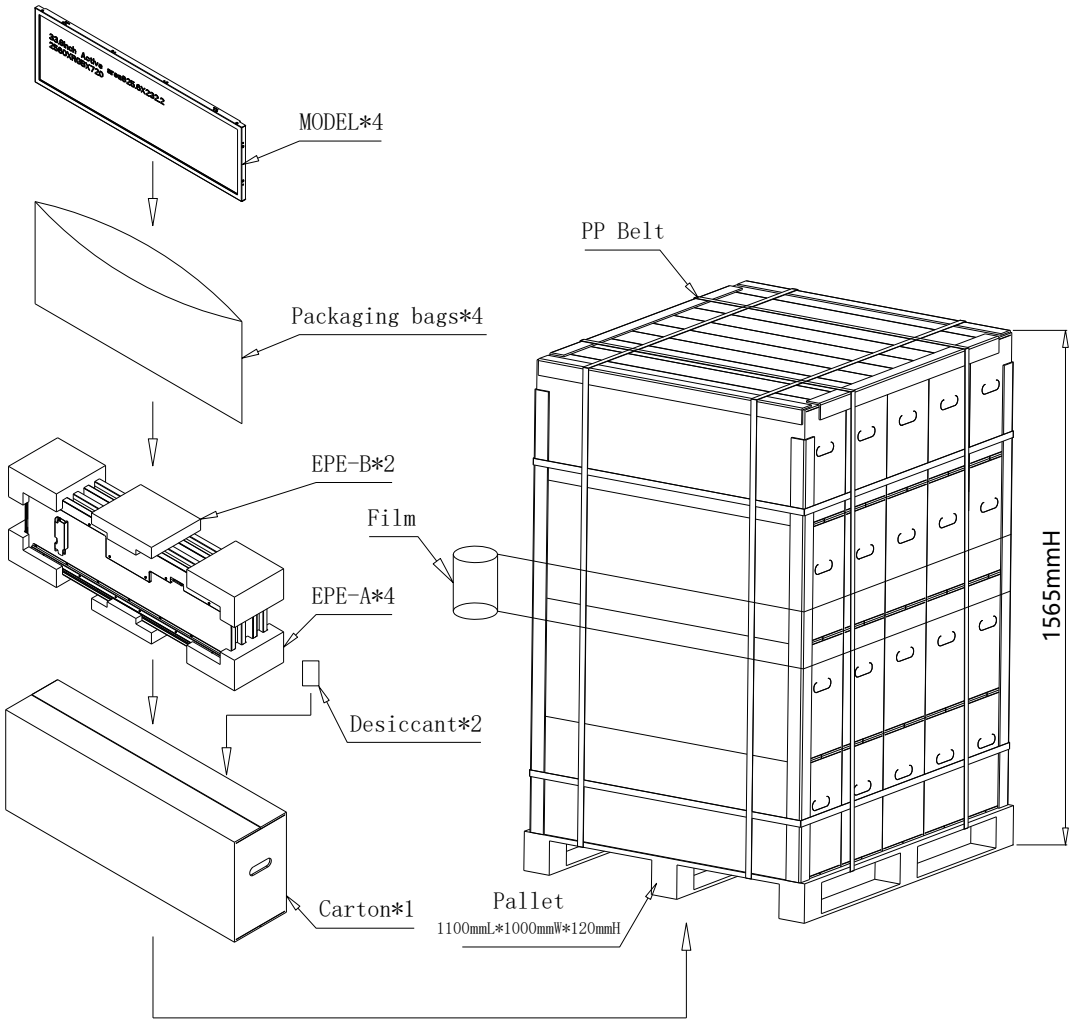
(1) 4 LCD modules / 1 Box

(2)Package quantity in one Pallet : TBD

(3) Box dimensions (mm):TBD

(4) Weight :TBD

13.2 Packing Method



13.3 BOX Label

DBT

14. HANDING & CAUTIONS

14.1 Mounting Method

- The panel of the LCD consists of two thin glasses with polarizers which easily get damaged. So extreme care should be taken when handling the LCD.
- Excessive stress or pressure on the glass of the LCD should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Mount a LCD module with the specified mounting parts.

14.2 caution of LCD Handling and Cleaning

- Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration,and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- The polarizers on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizers or it leads the polarizers to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent（recommended below） to clean the LCD‘s surface with wipe lightly.
  -IPA(Isopropyl Alcohol), Ethyl Alcohol, Trichlorotriflorothane
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizers and others. Do not use the following solvent.
  -Water, Ketone, Aromatics
- It is recommended that the LCD be handled with soft gloves during assembly, etc. The polarizers on the LCD's surface are vulnerable to scratch and thus to be damaged by sharp particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC,Soldering flux,Chlorine,Sulfur,saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

14.3 Caution Against Static Charge

- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device likeion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

14.4 Caution For operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher Voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature (hot to cold or cold to hot），the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

14.5 Packaging

- Modules use LCD element, and must be treated as such.
  -Avoid intense shock and falls from a height.
  -To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

14.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
- Original protective film should be used on LCD’s surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizers.
- Do not store the LCD near organic solvents or corrosive gasses.
- Keep the LCD safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCD is stored for long time in the
- lower temperature or mechanical shocks are applied onto the LCD.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
  -Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
  -Store in a dark place where neither exposure to direct sunlight nor light is.
  -Keep temperature in the specified storage temperature range.
  -Store with no touch on polarizer surface by the anything else. If possible, store the LCD in the packaging situation LCD when it was delivered.

14.7 Safety

- For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol an should be burned up later.
- In the case the LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water an soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water,then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal should get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.